

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment A

Flow Frequency Memo, Flow Interpolation, 303(d) Fact Sheet

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY Piedmont Regional Office 4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
Town of Lawrenceville WWTP – VA0020354

TO: Jeremy Kazio

FROM: Jennifer Palmore, P.G.

DATE: April 12, 2012

COPIES: Modeling File

The Town of Lawrenceville WWTP discharges to Roses Creek in Brunswick County. The outfall is located at rivermile 5ARSE000.28. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit.

During the years 2002-2003, ten streamflow measurements were made on Roses Creek at the Route 58 bridge (#02051715), which is approximately 0.2 mile upstream of the discharge. The measurements were correlated with the same-day daily mean flows at the continuous record gage on the Meherrin River near Lawrenceville (#02051500), which has been operated since 1928. The measurements and daily mean values were plotted on a logarithmic graph and a best-fit power trend line was plotted through the data points. The required flow frequencies from the reference gage were plugged into the equation for the regression line to calculate the associated flow frequencies at the measurement site on Roses Creek. There is strong confidence in the regression analysis because a very good correlation was obtained and several of the streamflow measurements on the Meherrin River were obtained during low flow conditions that were below its 7Q10. Due to the proximity between the measuring point at Route 58 and the discharge point, the flow frequencies from the measuring site are assumed to be equal. The flows are listed below.

Meherrin River near Lawrenceville, VA (#02051500)

Drainage Area - 552 mi²

Statistical period - 1928-2003

High Flow Months – January to April

| | |
|----------------|---------------------------|
| 1Q30 = 6.0 cfs | High Flow 1Q10 = 90 cfs |
| 1Q10 = 12 cfs | High Flow 7Q10 = 116 cfs |
| 7Q10 = 14 cfs | High Flow 30Q10 = 172 cfs |
| 30Q10 = 23 cfs | HM = 131 cfs |
| 30Q5 = 35 cfs | |

Roses Creek at Route 58, at Lawrenceville, VA (#02051715)

Drainage Area - 27.3 mi²

| | |
|-------------------------------|---------------------------------------|
| 1Q30 = 0.237 cfs (0.153 MGD) | High Flow 1Q10 = 4.05 cfs (2.62 MGD) |
| 1Q10 = 0.490 cfs (0.317 MGD) | High Flow 7Q10 = 5.29 cfs (3.42 MGD) |
| 7Q10 = 0.576 cfs (0.372 MGD) | High Flow 30Q10 = 7.99 cfs (5.17 MGD) |
| 30Q10 = 0.969 cfs (0.626 MGD) | HM = 6.01 cfs (3.88 MGD) |
| 30Q5 = 1.51 cfs (0.973 MGD) | |

This analysis does not address any withdrawals, discharges, or springs influencing the flow between the measurement site and discharge point.

The flows listed above are based upon current conditions and are influenced by the discharge from the Town of Alberta STP. If the Alberta STP discharge were to shut down, the flows in Roses Creek would

reduce slightly. To calculate the flow frequencies, the flow values collected at the measurement site were reduced by the amount that the Alberta STP discharged on each specific day (as reported in the facility's DMRs). The regression and flow frequencies were then calculated as described above. The expected flow frequencies if the influence from Alberta STP were to be removed are as follows:

Roses Creek at Route 58, at Lawrenceville, VA (#02051715)

Drainage Area - 27.3 mi²

| | |
|-------------------------------|---------------------------------------|
| 1Q30 = 0.210 cfs (0.136 MGD) | High Flow 1Q10 = 3.89 cfs (2.51 MGD) |
| 1Q10 = 0.443 cfs (0.286 MGD) | High Flow 7Q10 = 5.11 cfs (3.31 MGD) |
| 7Q10 = 0.523 cfs (0.338 MGD) | High Flow 30Q10 = 7.82 cfs (5.05 MGD) |
| 30Q10 = 0.893 cfs (0.577 MGD) | HM = 5.83 cfs (3.77 MGD) |
| 30Q5 = 1.41 cfs (0.908 MGD) | |

Roses Creek has historically been considered a Tier 1 water and antidegradation was not applied during the 1979 and 1996 modeling efforts. Both models indicate dissolved oxygen levels will fall to or below 5.0 mg/L during critical conditions.

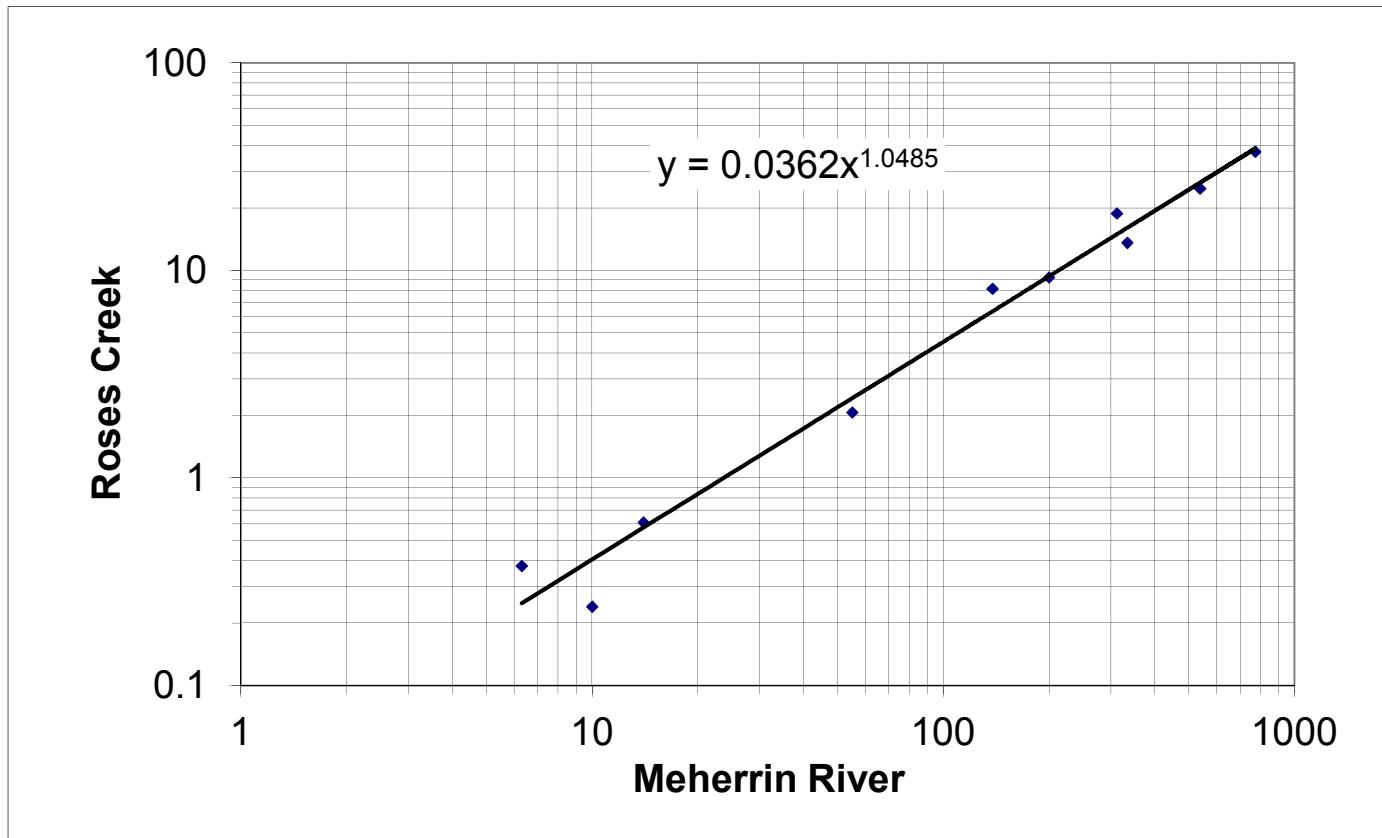
Water quality data from monitoring station 5ARSE001.22 is attached. The station is located on Roses Creek at the Route 678 bridge and is approximately 1 mile upstream of the discharge.

During the 2010 305(b)/303(d) Integrated Water Quality Assessment, Roses Creek from the Alberta STP to its mouth was considered a Category 4A waterbody ("Impaired or threatened for one or more designated uses but does not require a TMDL because the TMDL for specific pollutant(s) is complete and US EPA approved.") The Recreation Use was impaired due to E. coli exceedances; the applicable fact sheet is attached. The Aquatic Life Use and Wildlife Use were assessed as fully supporting. The Fish Consumption Use was not assessed.

The Roses Creek Bacterial TMDL was approved by the EPA on 7/6/2004 and by the SWCB on 12/2/2004. The Town of Lawrenceville WWTP was inadvertently excluded from the original TMDL, but the TMDL was subsequently modified on 7/17/2007 to add the facility. The Lawrenceville WWTP received an E. coli wasteload allocation of 4.18E+12 cfu/year based on the current design flow of 1.2 MGD plus an additional 1.2 MGD of future growth, if needed.

If you have any questions, please let me know.

Roses Creek at Route 58 at Lawrenceville, VA (#02051715)
 vs. Meherrin River near Lawrenceville, VA (#02051500)

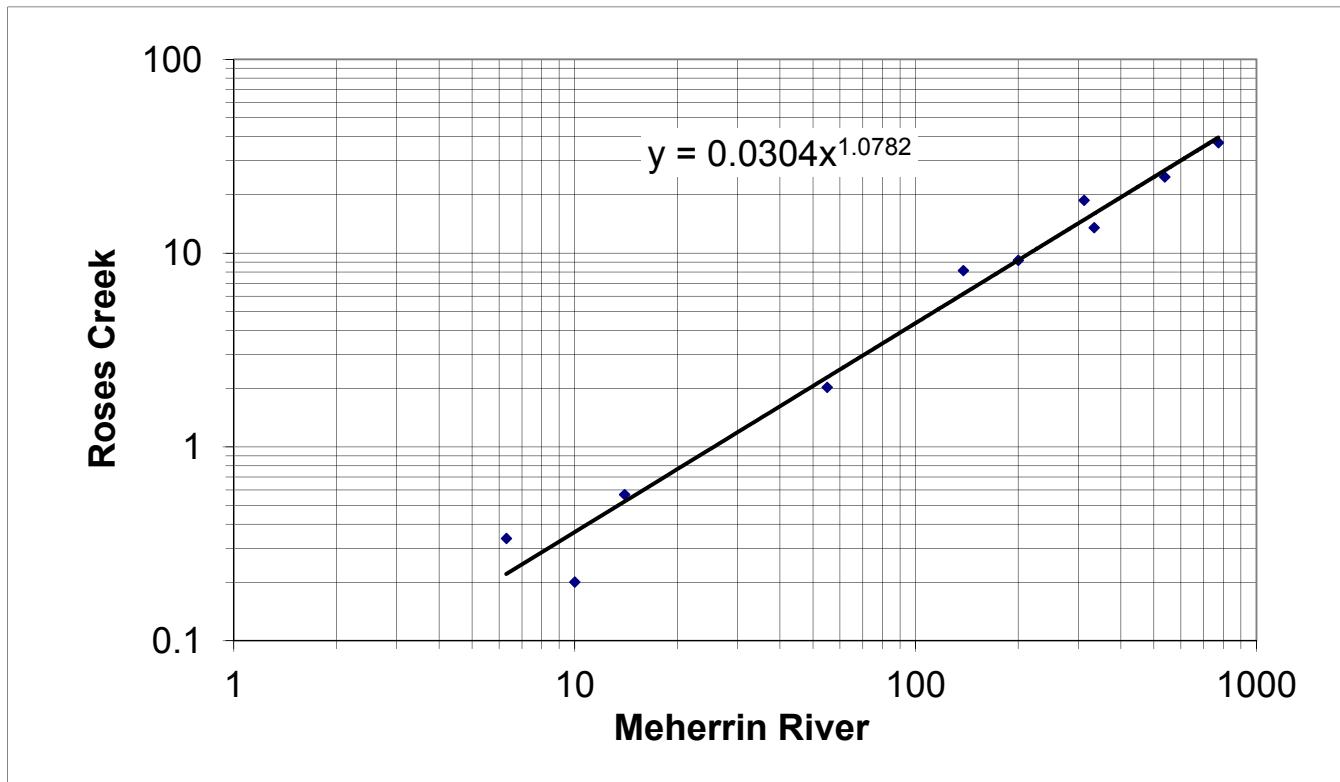


| Flow Data (cfs) | | | Flow Frequencies | | |
|-----------------|----------|-------|------------------|-------------|-------------|
| Date | Meherrin | Roses | Meherrin (cfs) | Roses (cfs) | Roses (MGD) |
| 4/16/2002 | 138 | 8.16 | 6.0 | 0.237 | 0.153 |
| 6/4/2002 | 55 | 2.07 | 12 | 0.490 | 0.317 |
| 7/17/2002 | 6.3 | 0.377 | 14 | 0.576 | 0.372 |
| 8/6/2002 | 10 | 0.240 | 23 | 0.969 | 0.626 |
| 10/7/2002 | 14 | 0.610 | 35 | 1.51 | 0.973 |
| 11/25/2002 | 200 | 9.25 | 30Q5 | 4.05 | 2.62 |
| 3/11/2003 | 538 | 24.8 | 90 | HF 1Q10 | 5.29 |
| 6/17/2003 | 773 | 37.3 | 116 | HF 7Q10 | 3.42 |
| 8/19/2003 | 334 | 13.6 | 172 | HF 30Q10 | 5.17 |
| 10/15/2003 | 312 | 18.8 | 131 | HM | 6.01 |

| SUMMARY OUTPUT | | |
|------------------------------|-------|---------|
| <u>Regression Statistics</u> | | |
| Multiple R | 0.991 | 23 |
| R Square | 0.982 | 35 |
| Adjusted R Square | 0.980 | 90 |
| Standard Error | 1.746 | HF 1Q10 |
| Observations | 10 | 4.05 |

| | | |
|----------------|----------------------|-------------|
| Meherrin (cfs) | Roses (cfs) | Roses (MGD) |
| 12 | 1Q10 | 0.490 |
| 14 | 7Q10 | 0.576 |
| 23 | 30Q10 | 0.969 |
| 35 | 30Q5 | 1.51 |
| 90 | HF 1Q10 | 4.05 |
| 116 | HF 7Q10 | 5.29 |
| 172 | HF 30Q10 | 3.42 |
| 131 | HM | 5.17 |
| 552 | DA (mi^2) | 6.01 |
| | Jan-Apr | 3.88 |

**Roses Creek at Route 58 at Lawrenceville, VA (#02051715)
vs. Meherrin River near Lawrenceville, VA (#02051500)**



Flow Data (cfs)

| Date | Meherrin | Roses | Roses - STP |
|------------|----------|-------|-------------|
| 4/16/2002 | 138 | 8.16 | 8.13 |
| 6/4/2002 | 55 | 2.07 | 2.03 |
| 7/17/2002 | 6.3 | 0.377 | 0.338 |
| 8/6/2002 | 10 | 0.240 | 0.201 |
| 10/7/2002 | 14 | 0.610 | 0.569 |
| 11/25/2002 | 200 | 9.25 | 9.19 |
| 3/11/2003 | 538 | 24.8 | 24.7 |
| 6/17/2003 | 773 | 37.3 | 37.2 |
| 8/19/2003 | 334 | 13.6 | 13.5 |
| 10/15/2003 | 312 | 18.8 | 18.7 |

SUMMARY OUTPUT

| Regression Statistics | |
|------------------------------|-------|
| Multiple R | 0.991 |
| R Square | 0.982 |
| Adjusted R Square | 0.980 |
| Standard Error | 1.748 |
| Observations | 10 |

Flow Frequencies

| Meherrin (cfs) | Roses (cfs) | Roses (MGD) |
|----------------|----------------------|-------------|
| 6.0 | 1Q30 | 0.210 |
| 12 | 1Q10 | 0.443 |
| 14 | 7Q10 | 0.523 |
| 23 | 30Q10 | 0.893 |
| 35 | 30Q5 | 1.41 |
| 90 | HF 1Q10 | 3.89 |
| 116 | HF 7Q10 | 5.11 |
| 172 | HF 30Q10 | 7.82 |
| 131 | HM | 5.83 |
| 552 | DA (mi^2) | 27.3 |
| | Jan-Apr | |

| Date | STP flow (MGD) | STP flow (cfs) |
|------------|----------------|----------------|
| 4/16/2002 | 0.0168 | 0.0260 |
| 6/4/2002 | 0.0238 | 0.0368 |
| 7/17/2002 | 0.0255 | 0.0395 |
| 8/6/2002 | 0.0251 | 0.0388 |
| 10/7/2002 | 0.0267 | 0.0413 |
| 11/25/2002 | 0.0364 | 0.0563 |
| 3/11/2003 | 0.0414 | 0.0641 |
| 6/17/2003 | 0.0634 | 0.0981 |
| 8/19/2003 | 0.0354 | 0.0548 |
| 10/15/2003 | 0.0331 | 0.0512 |

2010 Fact Sheets for 303(d) Waters

| | | | |
|-----------------------------|--------------------------------------|-------------------------------|-------------|
| RIVER BASIN: | Chowan River and Dismal Swamp Basins | HYDROLOGIC UNIT: | 03010204 |
| STREAM NAME: | Roses Creek | | |
| TMDL ID: | K07R-02-BAC | 2010 IMPAIRED AREA ID: | VAP-K07R-02 |
| ASSESSMENT CATEGORY: | 4A | TMDL DUE DATE: | 2004 |
| IMPAIRED SIZE: | 9.85 - Miles | Watershed: | VAP-K07R |
| INITIAL LISTING: | 1996 | | |
| UPSTREAM LIMIT: | Town of Alberta STP discharge | | |
| DOWNTSTREAM LIMIT: | Great Creek confluence | | |

From the Alberta Sewage Treatment Plant discharge to the mouth at Great Creek.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: E. coli

Roses Creek from the Alberta STP discharge downstream to its mouth at Great Creek was previously evaluated as not supporting of the Recreation use support goal based on fecal coliform standard exceedances at the Route 678 bridge (5ARSE001.22). The TMDL was completed for E. coli and was adopted by the SWCB on 12/2/04.

During the 2010 cycle, the segment remained impaired with an E. coli exceedance rate of 13/33 at 5ARSE001.22 and 4/12 at 5ARSE000.23. The exceedance rate at 5ARSE006.68 was 1/12.

IMPAIRMENT SOURCE: Nonpoint Source, PS - Municipal

Allocations were given to both point and nonpoint sources.

RECOMMENDATION: Implementation

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment B

Topographic Map, Aerial Photo, Facility Flow Diagram

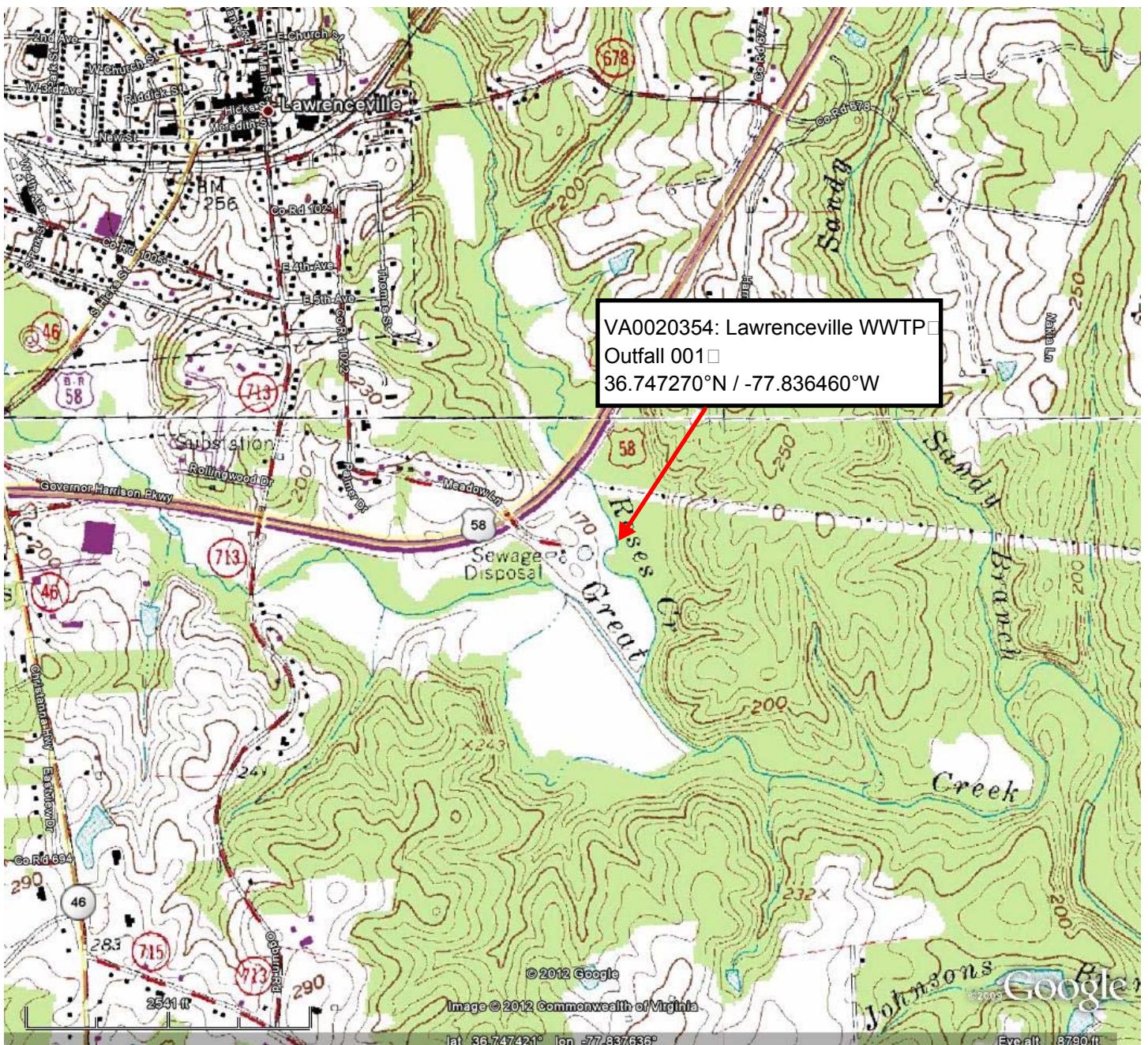
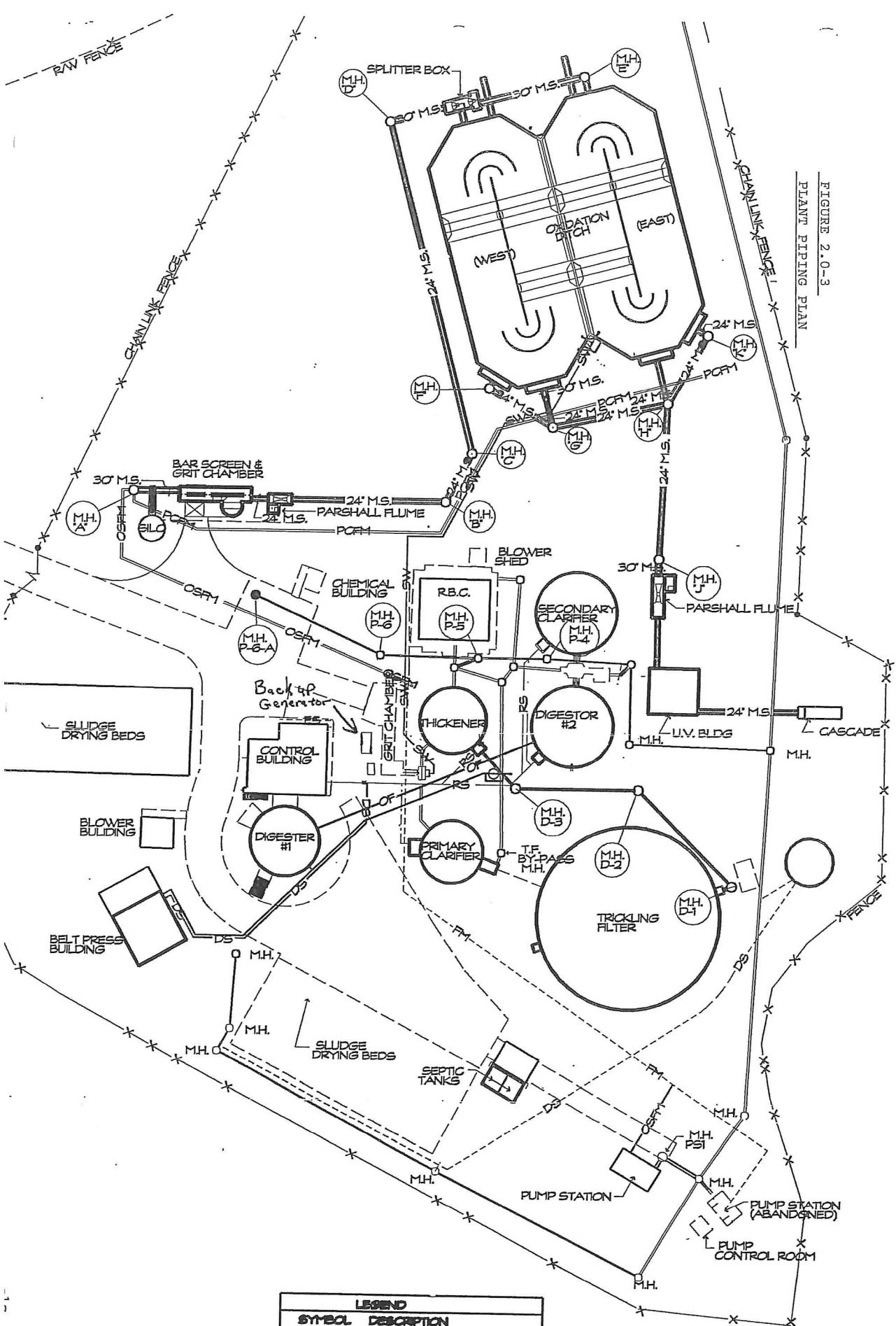
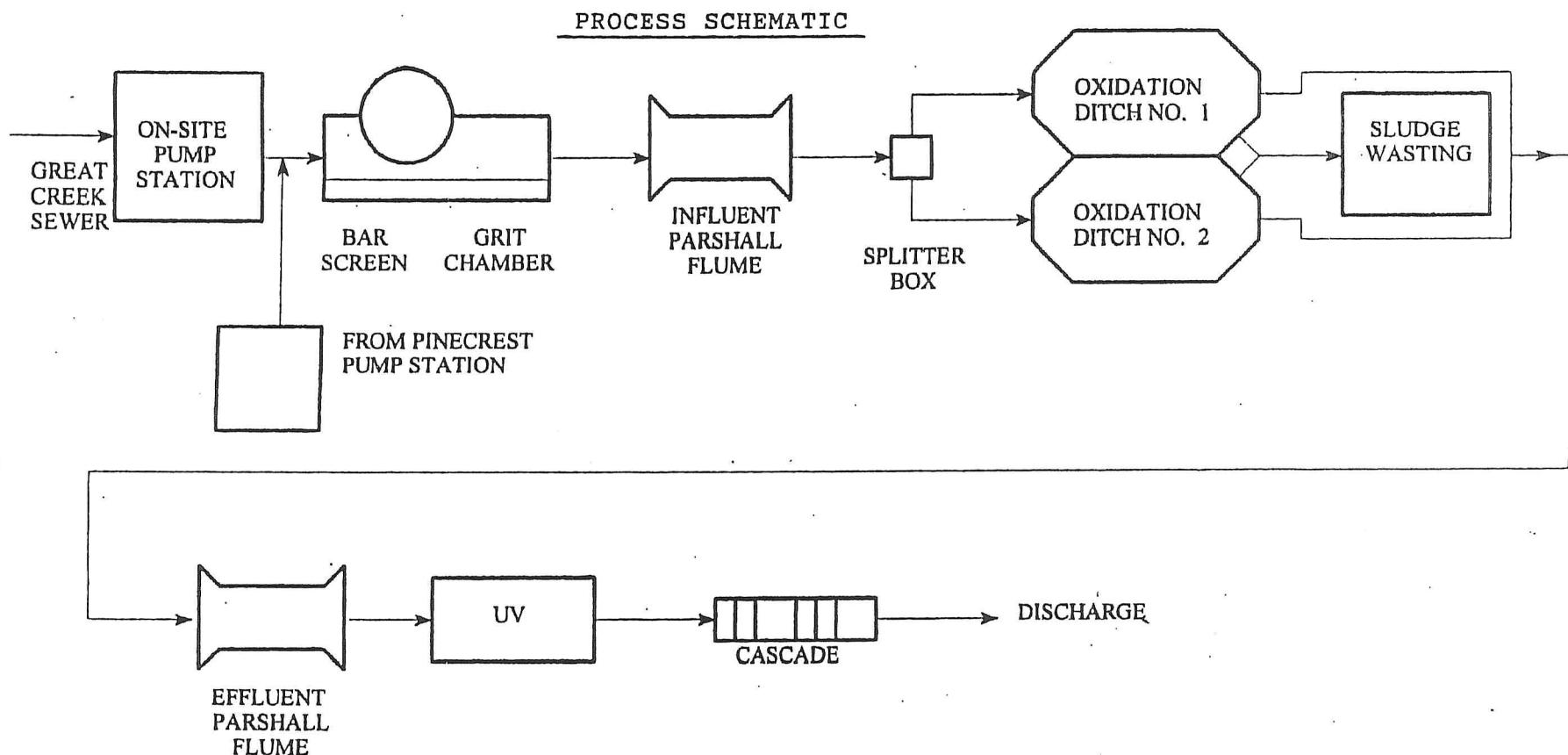




FIGURE 2.0-3
PLANT PIPING PLAN



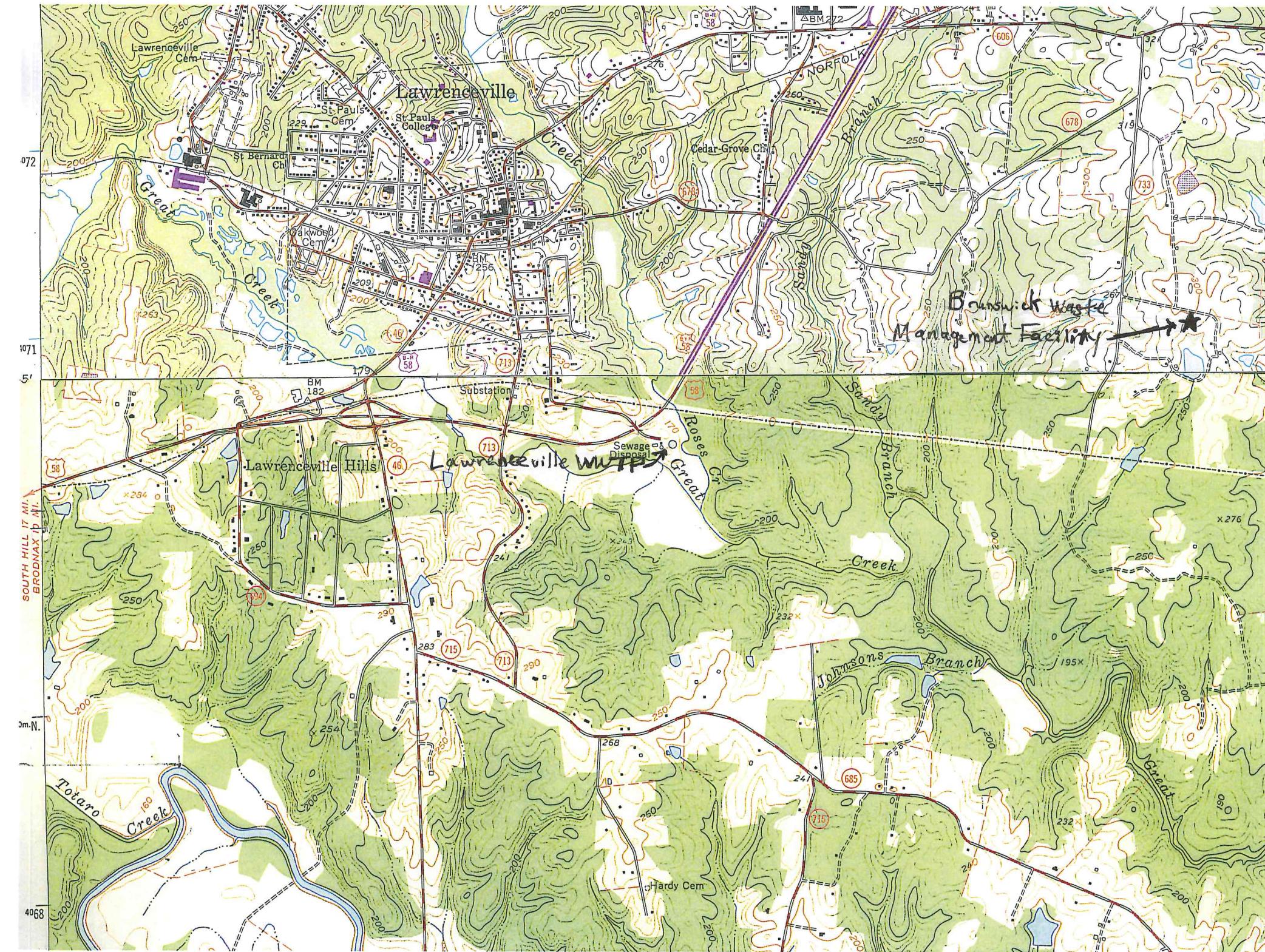
| LEGEND | |
|--------|-----------------------|
| SYMBOL | DESCRIPTION |
| — | MAIN SEWER |
| — | RETURN SLUDGE |
| — | DIGESTED SLUDGE |
| — | ON-SITE FORCE MAIN |
| — | PINE CREST FORCE MAIN |
| — | OVERFLOW LINE |

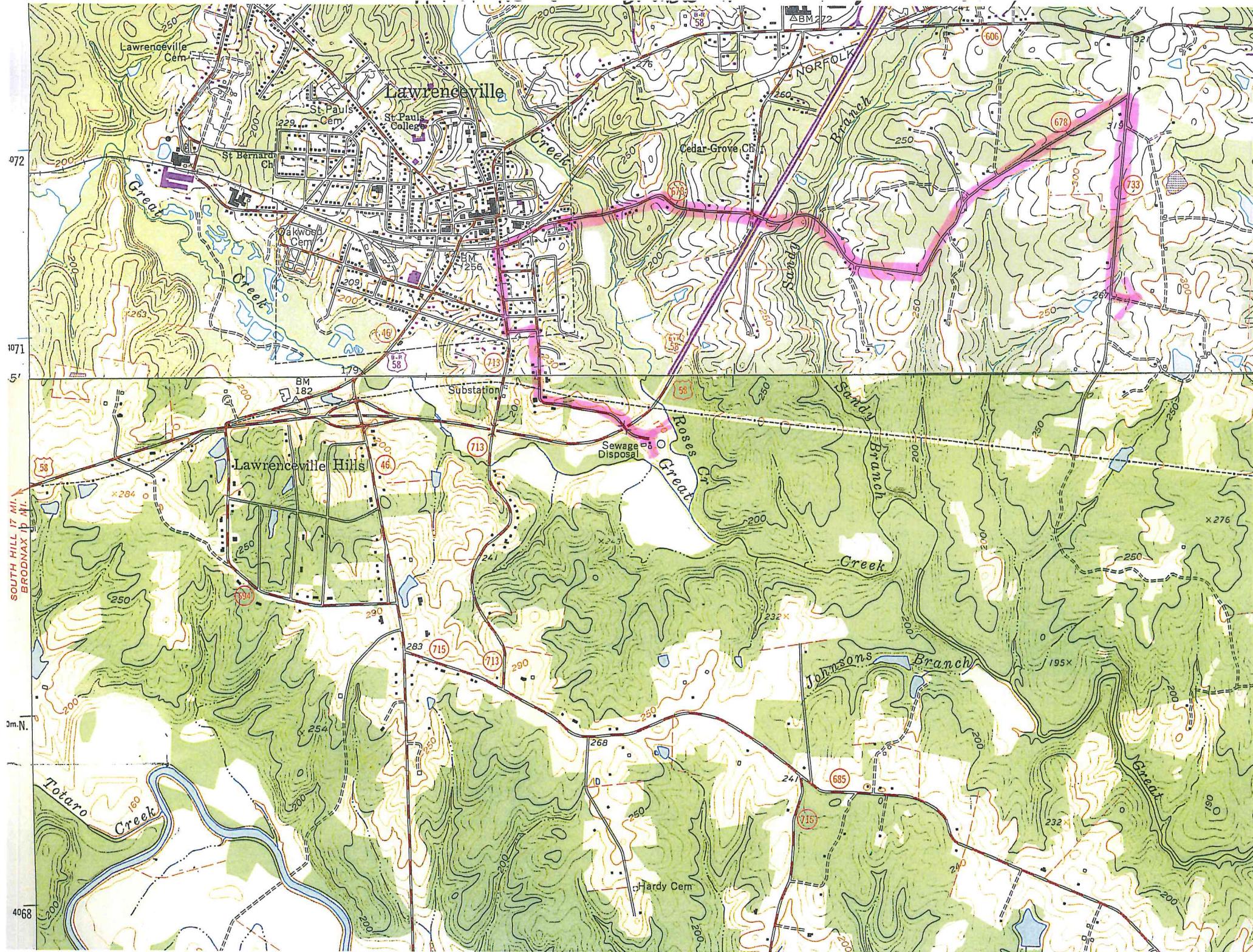


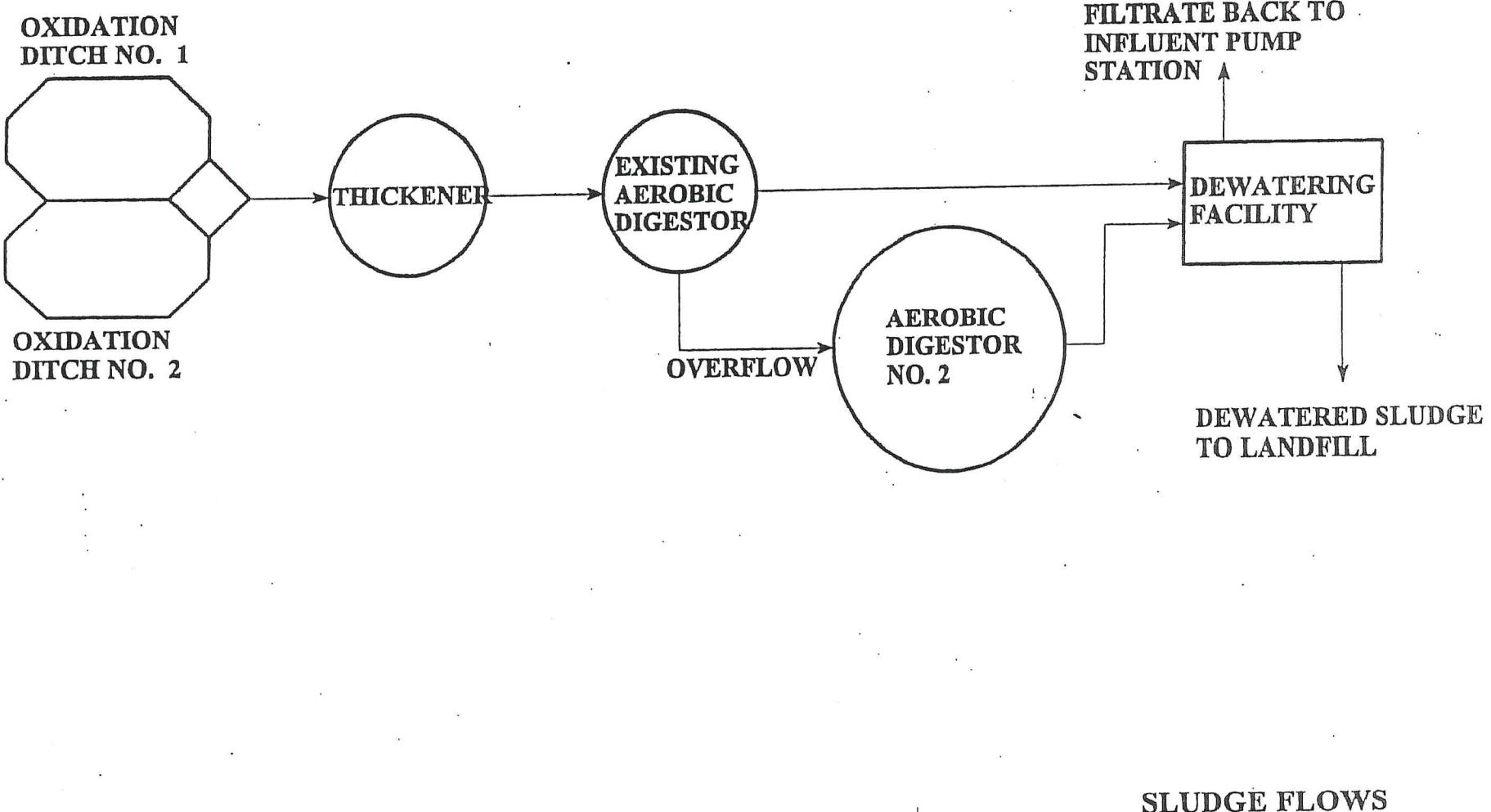
Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment C

Sludge Process Description, Sludge Haul Map







2.0.6 Sludge Handling system

The sludge handling system includes waste activated sludge (WAS) pumps, which are an integral part of the secondary treatment system). See Figure 2.0-8 -Sludge Handling System Layout for location of equipment.

The sludge wasting pumps convey the sludge to the thickener. Following thickening the sludge is routed to Digester No. 1 and then to Digester No. 2.

Sludge aeration in the aerobic digester helps support biological growth, removing nutrients and stabilizing the sludge. Mixing and oxygen requirements are met by surface aerators. Supernatant is decanted from the top tanks through telescopic valve arrangements and is returned to the head of the plant through the plant drain system for further processing.

Stabilized digested sludge is pumped to the dewatering building. Dewatered sludge is trucked to the Brunswick County Solid Waste Management facility, where it is land filled.

2.1 Raw Sewage Characteristics

Sewage flow-rates vary over a wide range depending on such things as time of day, infiltration and inflow, seasonal variations, etc. Influent flow rates at the plant can be expected

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment D

Receiving Stream Information and Stream Model

2012 Permit Reissuance - Lawrenceville Wastewater Treatment Plant (VA0020354)

| Collection Date | Sample Depth (meters) | Temperature (°C) | pH (SU) | Dissolved Oxygen (mg/L) | Dissolved Oxygen - Winkler (mg/L) | Dissolved Oxygen - FTD Optical (mg/L) | Hardness (mg/L as CaCO ₃) | Ambient Temps-High Flow Months (°C) |
|-----------------|-----------------------|------------------|---------|-------------------------|-----------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|
| 7/13/1994 | 0.3 | 23.99 | 6.77 | 5.06 | | | 36 | |
| 10/19/1994 | 0.3 | 10.83 | 6.66 | 7.88 | | | 27 | |
| 1/11/1995 | 0.3 | 4.44 | 6.71 | 11.87 | | | 22 | 4.44 |
| 4/24/1995 | 0.3 | 12.72 | 6.78 | 7.72 | | | 32 | 12.72 |
| 7/26/1995 | 0.3 | 24.57 | 6.61 | 4.59 | | | 40 | |
| 10/30/1995 | 0.3 | 11.16 | 6.56 | 8.06 | | | 24 | |
| 1/23/1996 | 0.3 | 1.73 | 6.24 | 12.39 | | | 15 | 1.73 |
| 4/16/1996 | 0.3 | 16.33 | 6.65 | 9.36 | | | 21 | 16.33 |
| 7/8/1996 | 0.3 | 22.15 | 6.82 | 6.54 | | | 28 | |
| 10/2/1996 | 0.3 | 17.55 | 6.72 | 8.41 | | | 27 | |
| 1/6/1997 | 0.3 | 10.15 | 6.46 | 10.31 | | | 24 | 10.15 |
| 4/15/1997 | 0.3 | 10.73 | 6.88 | 9.73 | | | 24.3 | 10.73 |
| 9/18/1997 | 0.3 | 19.81 | 6.75 | 6.7 | | | 13.7 | |
| 11/24/1997 | 0.3 | 7.47 | 6.58 | 10.34 | | | 26 | |
| 1/28/1998 | 0.3 | 6.65 | 6.22 | 10.71 | | | 12.8 | 6.65 |
| 3/25/1998 | 0.3 | 8.01 | 6.58 | 11.28 | | | 10.7 | 8.01 |
| 5/21/1998 | 0.3 | 18.13 | 6.86 | 7.46 | | | 20 | |
| 7/30/1998 | 0.3 | 22.9 | 6.64 | 5.85 | | | 32 | |
| 9/24/1998 | 0.3 | 17.65 | 6.9 | 5.34 | | | 25.2 | |
| 11/19/1998 | 0.3 | 8.53 | 6.65 | 7.72 | | | 25.4 | |
| 1/21/1999 | 0.3 | 6.04 | 6.13 | 10.85 | | | 30 | 6.04 |
| 3/10/1999 | 0.3 | 4.28 | 6.78 | 12.59 | | | 40 | 4.28 |
| 5/19/1999 | 0.3 | 15.97 | 6.77 | 7.7 | | | 30 | |
| 7/22/1999 | 0.3 | 24.11 | 6.9 | 6.33 | | | 32.8 | |
| 9/15/1999 | 0.3 | 20 | 6.58 | 7.77 | | | 20.5 | |
| 11/3/1999 | 0.3 | 12.85 | 6.32 | 8.82 | | | | |
| 1/19/2000 | 0.3 | 2.44 | 6.53 | 12.78 | | | 18.5 | 2.44 |
| 3/8/2000 | 0.3 | 10.02 | 6.62 | 10.44 | | | 17 | 10.02 |
| 5/8/2000 | 0.3 | 18.29 | 6.66 | 7.41 | | | 16 | |
| 6/29/2000 | 0.3 | 22.33 | 6.45 | 6.9 | | | 18.5 | |
| 9/6/2000 | 0.3 | 18.56 | 6.49 | 7.8 | | | 20.5 | |
| 10/13/2000 | 0.3 | 12.3 | 7.8 | 11 | | | | |
| 11/29/2000 | 0.3 | 5.5 | 6.29 | 10.5 | 11 | | 21.4 | |
| 2/1/2001 | 0.3 | 6.63 | 7.21 | 11.75 | | | 20.6 | 6.63 |
| 3/29/2001 | 0.3 | 7.29 | 6.87 | 11.18 | | | 22.9 | 7.29 |
| 3/18/2002 | 0.3 | 10.15 | 6.64 | 9.74 | | | | 10.15 |
| 4/18/2002 | 0.3 | 21.62 | 6.77 | 7.39 | | | | 21.62 |
| 5/7/2002 | 0.3 | 16.82 | 6.57 | 8.3 | | | | |
| 7/2/2002 | 0.3 | 22.55 | 6.56 | 2.42 | | | 44.6 | |
| 7/30/2002 | 0.3 | 26.39 | 6.52 | 5.01 | | | | |
| 9/5/2002 | 0.3 | 22.4 | 6.73 | 5.2 | | | | |
| 10/29/2002 | 0.3 | 11.85 | 5.91 | 11.26 | | | | |
| 11/25/2002 | 0.3 | 6.82 | 6.13 | 11.34 | | | | |
| 12/10/2002 | 0.3 | 2.46 | 7.18 | 13.08 | | | | |
| 1/13/2003 | 0.3 | 1.26 | 7 | 13.55 | | | | 1.26 |
| 2/11/2003 | 0.3 | 3.16 | 6.76 | 14.2 | | | | 3.16 |
| 3/11/2003 | 0.3 | 6.27 | 6.86 | 11.88 | | | | 6.27 |
| 4/2/2003 | 0.3 | 11.83 | 6.5 | 10.23 | | | | 11.83 |
| 4/21/2003 | 0.3 | 12.3 | 6.45 | 9.89 | | | | 12.3 |
| 5/1/2003 | 0.3 | 18.8 | 6.49 | 8.84 | | | | |
| 5/28/2003 | 0.3 | 15.91 | 6.4 | 8.94 | | | | |
| 6/5/2003 | 0.3 | 18.6 | 6.63 | 9.9 | | | | |
| 6/17/2003 | 0.3 | 19.19 | 6.31 | 8.49 | | | | |
| 7/1/2003 | 0.3 | 21.63 | 6.62 | 7.53 | | | | |
| 7/17/2003 | 0.3 | 22.53 | 6.95 | 7.25 | | | | |
| 7/28/2003 | 0.3 | 22.87 | 7.09 | 7.02 | | | | |

2012 Permit Reissuance - Lawrenceville Wastewater Treatment Plant (VA0020354)

| Collection Date | Sample Depth (meters) | Temperature (°C) | pH (SU) | Dissolved Oxygen (mg/L) | Dissolved Oxygen - Winkler (mg/L) | Dissolved Oxygen - FTD Optical (mg/L) | Hardness (mg/L as CaCO ₃) | Ambient Temps-High Flow Months (°C) |
|------------------------|-----------------------|------------------|------------|-------------------------|-----------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|
| 8/5/2003 | 0.3 | 23.07 | 7.12 | 7.85 | | | | |
| 8/19/2003 | 0.3 | 22.97 | 6.96 | 7.43 | | | | |
| 9/23/2003 | 0.3 | 21.49 | 6.15 | 7.03 | | | | |
| 10/20/2003 | 0.3 | 12.42 | 7.04 | 9.44 | | | | |
| 11/19/2003 | 0.3 | 15.68 | 6.54 | 8.76 | | | | |
| 12/10/2003 | 0.3 | 4.82 | 6.86 | 12.15 | | | | |
| 5/23/2005 | 0.3 | 16.39 | 6.98 | 8.22 | | | 28 | |
| 7/12/2005 | 0.3 | 23.16 | 7.03 | 6.2 | | | 34 | |
| 11/21/2005 | 0.3 | 9.78 | 6.95 | 12.89 | | | 26 | |
| 1/25/2006 | 0.3 | 7.29 | 6.69 | 11.17 | | | 23 | 7.29 |
| 3/9/2006 | 0.3 | 8.6 | 7.3 | 12.1 | | | 24 | 8.6 |
| 5/23/2006 | 0.3 | 15.2 | 7 | 9.3 | | | 34 | |
| 7/24/2006 | 0.3 | 22.4 | 7.4 | 7.2 | | | 24 | |
| 9/20/2006 | 0.3 | 19.3 | 6.9 | 7.6 | | | 26 | |
| 11/30/2006 | 0.3 | 11.7 | 6.5 | 10.1 | | | 28 | |
| 1/7/2008 | 0.3 | 3.9 | 7.6 | | | 11.3 | | 3.9 |
| 2/11/2008 | 0.3 | 5.5 | 7.7 | | | 10.5 | | 5.5 |
| 3/12/2008 | 0.3 | 8 | 7.2 | 10.5 | | | | 8 |
| 4/1/2008 | 0.3 | 11.3 | 7.3 | 9.9 | | | | 11.3 |
| 5/1/2008 | 0.3 | 12.4 | 7.1 | 9.7 | | | | |
| 6/3/2008 | 0.3 | 18.4 | 7.4 | 7.2 | | | | |
| 7/2/2008 | 0.3 | 20.6 | 7.4 | 6.2 | | | | |
| 8/7/2008 | 0.3 | 23.7 | 7.4 | 4.6 | | | | |
| 9/9/2008 | 0.3 | 21.5 | 7.4 | 7.1 | | | | |
| 10/7/2008 | 0.3 | 15 | 7.5 | 7.8 | | | | |
| 11/4/2008 | 0.3 | 11.4 | 7 | 7.2 | | | | |
| 12/10/2008 | 0.3 | 6.5 | 7.2 | 12.3 | | | | 0.7 |
| 1/12/2011 | 0.3 | 0.7 | 7.6 | 13.8 | | | | 9.4 |
| 3/16/2011 | 0.3 | 9.4 | 6.6 | 9.7 | | | | |
| 5/16/2011 | 0.3 | 17.1 | 7 | 7.1 | | | | |
| 7/18/2011 | 0.3 | 21.4 | 7.1 | 5.9 | | | | |
| 9/6/2011 | 0.3 | 22 | 7.1 | 5.7 | | | | |
| 11/17/2011 | 0.3 | 13.2 | 6.8 | 7.4 | | | | |
| 2/13/2012 | 0.3 | 1.26 | 6.94 | 12.59 | | | | 1.26 |
| 90th Percentile | | 22.9 | 7.4 | | | | | 12.3 |
| 10th Percentile | | 4.4 | 6.4 | | | | | 1.7 |
| Average | | | | | | | 25.3 | 7.7 |

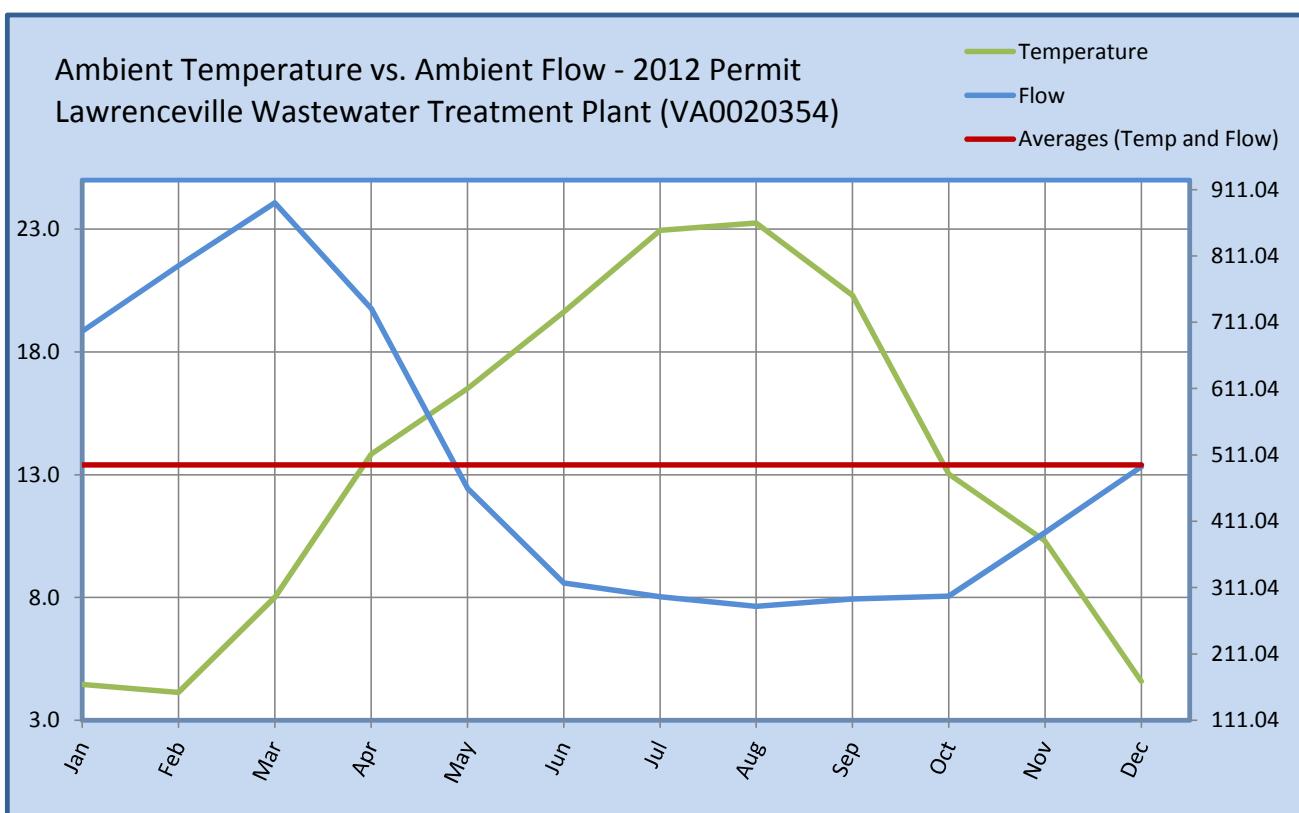
Winter/High Flow Confirmation - Informational

2012 Permit Reissuance - Lawrenceville Wastewater Treatment Plant (VA0020354)

| Month | Average Monthly Temperatures (°C) | | Average Monthly Flows (cfs) | |
|------------------|-----------------------------------|---|-----------------------------|----------------------|
| | Monitoring Station 5ARSE001.22 | USGS Flow Gage #02051500 (1929-2011) | Average Flow (cfs) | Above Yearly Average |
| Jan | 4.5 | X | 697 | X |
| Feb | 4.1 | X | 796 | X |
| Mar | 8.0 | X | 891 | X |
| Apr | 13.8 | | 732 | X |
| May | 16.5 | | 461 | |
| Jun | 19.6 | | 318 | |
| Jul | 22.9 | | 297 | |
| Aug | 23.2 | | 283 | |
| Sep | 20.3 | | 294 | |
| Oct | 13.0 | X | 298 | |
| Nov | 10.3 | X | 394 | |
| Dec | 4.6 | X | 493 | |
| Yearly Average ► | 13.4 | Yearly Average ► | 496 | |

| Winter Season | |
|---------------|-----------------|
| Basis | Month Range |
| Flow: | January - April |
| Temp.: | October - March |
| Combined: | January - March |

Please note that these winter months are determined by comparing relative values rather than actual values. Flows used for this evaluation are taken from a stream gage located on the Meherrin River, the data from which has been determined to have a strong correlation to flow variations in Roses Creek (see Flow Frequency memo in Attachment A). These flows do not represent actual flows within Roses Creek.



MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Water Regional OfficeP.O. Box 6030, 4900 Cox Road, Glen Allen, VA 23058

804/527-5020

SUBJECT: Recommended Effluent Limits for Lawrenceville STP (VA0020354)

TO: Curt Linderman, P.E.

FROM: Jon van Soestbergen, P.E.

DATE: April 25, 1996

COPIES: Diane Cook, Technical Services, Modeling File

The Roses Creek model used to determine recommended effluent limits for the subject facility was revised to exclude the Alberta STP discharge from the model, as this discharge is a significant distance upstream. The Regional Model, V3.2 used for the modeling effort does not require inclusion of discharges more than 3 miles upstream of the discharge being modeled.

Results of the revised model do not change the recommended effluent limits as presented in the April 11, 1996 memorandum regarding the stream sanitation analysis performed for Roses Creek. These recommended limits are repeated below.

Town of Lawrenceville, Municipal STP (VA0020354)

Dry Season, Low Flow (May - December)
(January-April)

Q = 1.2 mgd
cBOD₅ = 10.0 mg/l
TKN = 3.0 mg/l
DO = 6.5 mg/l

Wet Season, High Flow

Q = 1.2 mgd
cBOD₅ = 20.0 mg/l
TKN No limit necessary
DO = 5.0 mg/l

If you have any questions or require additional information related to this modeling effort, please do not hesitate to contact the PRO Planning Unit.

MEMORANDUM

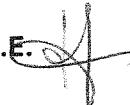
DEPARTMENT OF ENVIRONMENTAL QUALITY *Piedmont Water Regional Office*

P.O. Box 6030, 4900 Cox Road, Glen Allen, VA 23058

804/527-5020

SUBJECT: Results of Stream Sanitation Analysis of Roses Creek and Recommended Effluent Limits for Lawrenceville STP (VA0020354) and Alberta STP (VA0026816)

TO: Curt Linderman, P.E.

FROM: Jon van Soestbergen, P.E. 

DATE: April 11, 1996

COPIES: Diane Cook, Technical Services, Modeling File

Modeling Purpose

The Town of Lawrenceville submitted a VPDES Permit Application for a plant expansion from the current flow of 0.6 mgd to 1.2 mgd, which resulted in this stream sanitation analysis and modeling effort. The purpose of this memorandum is to document the results of the effort and to present recommended effluent limits for a discharge flow of 1.2 mgd. The increased discharge flow will exceed 1.0 mgd, requiring processing as a major discharge, and requiring VA DEQ Headquarters and EPA Region III review and concurrence.

Background Information

The Lawrenceville Municipal Sewage Treatment Plant (STP) is located on Meadow Lane in the Town of Lawrenceville, which is an incorporated Town within Brunswick County. The STP is currently permitted to discharge to Roses Creek at river mile 5ARSE000.28. Roses Creek is a tributary to Great Creek in DEQ Waterbody VAP-K07R-00 in the Meherrin River Subbasin of the Chowan River Basin. The proposed increased discharge location is the same as the current discharge location.

The design flow of the current STP is 0.6 mgd. The discharge is currently permitted under VPDES Permit No. VA0020534. Permitted effluent limits for 5-day biochemical oxygen demand (BOD_5) and dissolved oxygen (DO) are 30 mg/l and 6.5 mg/l, respectively. The discharge is addressed in the current Chowan River-Dismal Swamp Basins 303(e) Water Quality Management Plan (WQMP), adopted in April, 1982 (Table 2, page 10, and Table 3A, page 23). Discharge parameters and limits addressed in the WQMP are flow ($Q = 0.7$ mgd), BOD_5 (30 mg/l), and total suspended solids (30 mg/l).

The Town of Alberta Municipal STP discharges to Roses Creek at river mile 5ARSE009.83, upstream of the Lawrenceville discharge. The discharge is currently permitted for a design flow of 0.1 mgd under VPDES Permit No. VA0026816. Permitted effluent limits for BOD_5 and DO are 30 mg/l and 5.0 mg/l, respectively. This discharge is also addressed in the aforementioned WQMP.

The effects of the Lawrenceville STP discharge to Roses Creek on DO concentrations in Roses Creek and Great Creek have been previously modeled. The most recent model was created using the CBOXYSAG program in July, 1979. In January, 1987 the model was reexamined and effluent limits

Stream Sanitation Analysis Results, Roses Creek, Lawrenceville STP
Page 2

of $BOD_5 = 16 \text{ mg/l}$, $DO = 6.5 \text{ mg/l}$ were recommended for a discharge flow of 0.7 mgd. The effects of the Alberta STP on water quality in Roses Creek have not been modeled.

The Draft Plan and Draft Environmental Impact Statement, Great Creek Watershed, Brunswick and Lunenburg Counties, Virginia, Southside Soil and Water Conservation District, et. al., October 1975, was reviewed in connection with this modeling effort. This report addresses the construction of a multi-purpose impoundment on Great Creek, to be used for both flood control and as a source of water for one of the Town of Lawrenceville's public water supply intakes, located on Great Creek downstream of the impoundment. This report states that the minimum downstream releases from the impoundment will be equal to the annual 7 consecutive day mean low flow with a 10 year recurrence interval (7Q10) (page I-10). The report also provides the Great Creek drainage area above the impoundment location (Project Map, page I-12) and the elevation of Great Creek at its confluence with the Meherrin River (page II-29).

The Town of Lawrenceville collected water quality data on a monthly basis from Roses Creek as a VPDES permit condition from January 1992 through February 1994. Each data set consisted of measurements for DO, pH, temperature, and total ammonia. A total of 26 data sets were collected. A review of the DO, pH, and temperature data indicated that there was 1 violation of the pH standard. There were also 3 incidents where the difference in temperature above and below the STP discharge exceeded 3 degrees C. Monitored ammonia concentrations below the STP discharge were significantly higher than those above the discharge in more than 50 percent of the samples taken; however, ammonia concentrations in the stream were not checked for water quality standard violations.

DEQ maintains Ambient Water Quality Monitoring (AWQM) stations on Roses Creek and Great Creek. The Roses Creek station was initiated in 1994 and is located at the Route 678 bridge at river mile 5ARSE001.22, upstream of the Lawrenceville STP discharge. The Great Creek station was initiated in 1990 and is located at the Route 713 bridge at river mile 5AGTC005.40, upstream of the confluence of Roses Creek with Great Creek. Additionally, DEQ maintains two biological monitoring stations on Roses Creek. The biological monitoring stations are used to assess the effects of the Alberta STP discharge on general water quality in Roses Creek. A control station is located at river mile 5ARSE009.83, immediately upstream of the discharge. An impact station is located at river mile 5ARSE006.68, approximately three miles below the discharge.

Water quality data collected from the AWQM and biological monitoring stations were used to assess the Great Creek watershed (VAP-K07R-00) for the Clean Water Act's 1996 305(b) report. The assessment covers the period April 1993 through March 1995. The results of the assessment indicate that there is currently no impairment of Great Creek. Roses Creek was assessed not supporting for aquatic life use support based on a severely impaired benthic community at the impact biological monitoring station below the Alberta STP as compared to the benthic community at the control station. The segment consists of the 3.83 miles of Roses Creek from the Alberta STP discharge point downstream to the confluence of Roses Creek with Solomon Creek. Roses Creek was also assessed not supporting of swimming use based on 3 fecal coliform standard violations in 4 samples collected at AWQM station 5ARSE001.22. This segment consists of 9.83 miles of Roses Creek from the Alberta STP discharge downstream to the mouth of Roses Creek at its confluence with Great Creek. The segment assessed not supporting for swimming use based on the fecal coliform standard violations includes the Lawrenceville STP discharge location. The impairment of Roses Creek is attributed to the Alberta STP discharge. Both segments are included on the 303(d) list submitted to EPA by DEQ in April 1996, which lists and prioritizes segments requiring Total Maximum Daily Loads. These assessments reflect a downgraded assessment from the 1994 and 1992 305(b) cycles. In both the

Stream Sanitation Analysis Results, Roses Creek, Lawrenceville STP
Page 3

1994 and 1992 305(b) reports, the affected waterbodies were assessed fully supporting of designated Clean Water Act uses.

Site Inspection

On March 14, 1996, Planning Unit Staff and the Permit Writer performed a site inspection of the receiving stream near the Lawrenceville STP discharge. Town of Lawrenceville personnel were also present. The receiving stream was "walked" from the discharge location downstream to its confluence with Great Creek to characterize the stream channel, obtain instantaneous water quality data, and obtain a visual impression of overall water quality at the time of inspection. Because of accessibility constraints, Great Creek was not walked downstream of the confluence of Roses Creek and Great Creek. However, Great Creek was walked for approximately 0.2 miles upstream of the confluence to obtain a general impression of water quality. Instantaneous water quality data measurements taken consisted of dissolved oxygen (DO), temperature, and pH, and were taken at selected points along Roses Creek and in both Roses Creek and Great Creek at the confluence of the two creeks. Fecal coliform data was not collected during the site visit, as this water quality parameter is not directly associated with dissolved oxygen concentrations in the stream and not required for the modeling effort.

Results of the site inspection indicated that at the time of the site inspection overall water quality was good in Roses Creek downstream of the discharge and in Great Creek at the confluence of the two creeks. There were no sludge deposits and DO and pH were both at acceptable levels.

7Q10 Flow Determination

A flow frequency determination was performed by DEQ and documented in a March 6, 1996 memorandum to the permit writer. Dry season and wet season 7Q10 flows at the Lawrenceville STP discharge point were determined based on flow records from the VDEQ continuous record gage on Great Creek near Cochran, VA (#02051600) and a drainage area comparison. The results of the flow frequency determination are provided in the copy of the March 6, 1996 memorandum included with the attachment. Additionally, 7Q10 flows for Roses Creek at the Alberta STP discharge point and for the Meherrin River above its confluence with Great Creek were determined.

Tier Designation and Antidegradation Review

The waterbody segment affected by the Lawrenceville STP discharge is designated a Class III water in the Virginia Water Quality Standards (VR680-21-08-12). No special standards apply. The previous modeling effort indicates that under modeled conditions, the DO concentration in the affected segment will decrease to 5.0 mg/l, or the equivalent of the water quality standard for Class III waters, thereby satisfying requirements for a Tier 1 designation, with the parameter of concern being DO. Additionally, the base line water quality model prepared for this stream sanitation analysis, which simulates existing conditions, predicts that the water quality standard for DO would be violated in both Roses Creek and Great Creek under 7Q10 conditions. Fecal coliform standard violations do not satisfy requirements for Tier 1 designation.

Because Roses Creek and Great Creek are designated Tier 1 waters, antidegradation need not be applied for these waterbodies in the modeling effort. However, the Meherrin River at its confluence with Great Creek is designated a Tier 2 water, and antidegradation does apply to this waterbody.

Stream Sanitation Analysis Results, Roses Creek, Lawrenceville STP
Page 4

Modeling Approach

Because the current Alberta STP discharge to Roses Creek is considered a source of impairment of Roses Creek and has not been previously modeled, and because the Meherrin River is a Tier 2 water subject to antidegradation review, the model was expanded from previous modeling efforts to incorporate both Roses Creek between the Alberta STP and Lawrenceville STP discharges, and the Meherrin River.

The Regional Water Quality Model for Free Flowing Streams (Version 3.2) was used to model the effects of the current Alberta STP discharge and the proposed Lawrenceville discharge to Roses Creek. This model was used in lieu of the CBOXYSAG model used in previous modeling efforts because 1) the model was expanded to include additional discharges and waterbody segments, 2) the CBOXYSAG model was never used to establish permitted effluent discharge limits, and 3) PRO is making an effort to standardize the model used for determining effluent limits in simple modeling cases such as this one.

Model input data was obtained from several sources, including but not limited to the previously mentioned CBOXYSAG model and Draft Plan and EIS Report, the March 14, 1996 site inspection, several WQAP Flow Frequency Determination memoranda, and data from EPA's STORET database. Model input parameters, calculations, and justification are included in the attached model documentation.

The permittee verbally requested that wet weather relief be provided, if possible, through tiering of the discharge limits. Therefore, the effects of the discharge were modeled under both dry weather (low background flow) and wet weather (high background flow) conditions. Background flows and high flow months were established by WQAP in the Flow Frequency Determination memoranda.

Four waterbody segments were established for the model. The first consists of Roses Creek from the Alberta STP discharge point downstream to the Lawrenceville STP discharge point. The second consists of Roses Creek from the Lawrenceville STP discharge point downstream to its mouth at the confluence with Great Creek. The third consists of Great Creek from the confluence with Roses Creek downstream to its mouth at the confluence with the Meherrin River. The fourth and final segment consists of the Meherrin River flows from its confluence with Great Creek to a point five miles downstream.

To determine whether antidegradation is violated in the Meherrin River (segment 4), a base line model was established to predict the effect of the currently permitted discharges on DO concentrations in the modeled segments under 7Q10 conditions.

Results and Recommendations

The modeling effort to establish base line conditions predicts that water quality standards in Roses Creek are violated downstream of the Alberta STP discharge, and in Great Creek downstream of the Lawrenceville STP discharge under dry weather (low flow) 7Q10 conditions. Under wet weather (high flow) 7Q10 conditions, the model predicts water quality standards will be maintained with the currently permitted discharges.

The modeling effort performed for the proposed increased Lawrenceville discharge ($Q = 1.2 \text{ mgd}$) indicates that during the dry weather (low flow) season (May-December), water quality based effluent limits for cBOD_5 , Total Kjeldahl Nitrogen (TKN), and DO are necessary for the Alberta and Lawrenceville

Stream Sanitation Analysis Results, Roses Creek, Lawrenceville STP
Page 5

discharges to maintain the Class III water DO standard in Roses Creek and Great Creek, respectively. The model projects the DO sag in Roses Creek to be 1.4 miles downstream of the Alberta STP discharge. The model projects the DO sag in Great Creek to be 4.3 miles downstream of the confluence of Roses Creek with Great Creek.

The model predicts that for a discharge flow of 1.2 mgd during the wet weather (high flow) season (January-April), water quality based limits are not necessary to maintain water quality standards in Roses Creek or Great Creek. However, water quality based limits for cBOD₆ and DO are necessary for the Lawrenceville discharge to satisfy antidegradation requirements in the Meherrin River. Water quality based limits are not necessary for the Alberta STP discharge, and a TKN limit is not necessary for the Lawrenceville discharge under high flow conditions.

The Piedmont Regional Office Planning Staff recommend the effluent limits listed below be incorporated into the VPDES permit for the Town of Lawrenceville's proposed expanded discharge VPDES Permit. Furthermore, it is recommended that the Town of Alberta's VPDES permit be modified to incorporate the effluent limits listed to maintain water quality in Roses Creek under low flow 7Q10 conditions.

Town of Lawrenceville, Municipal STP (VA0020354)

Dry Season, Low Flow (May - December)

| | |
|-------------------|-------------|
| Q | = 1.2 mgd |
| cBOD ₆ | = 10.0 mg/l |
| TKN | = 3.0 mg/l |
| DO | = 6.5 mg/l |

Wet Season, High Flow (January-April)

| | |
|-------------------|--------------------|
| Q | = 1.2 mgd |
| cBOD ₆ | = 20.0 mg/l |
| TKN | No limit necessary |
| DO | = 5.0 mg/l |

Town of Alberta, Municipal STP (VA0026816)

Dry Season, Low Flow (May - December)

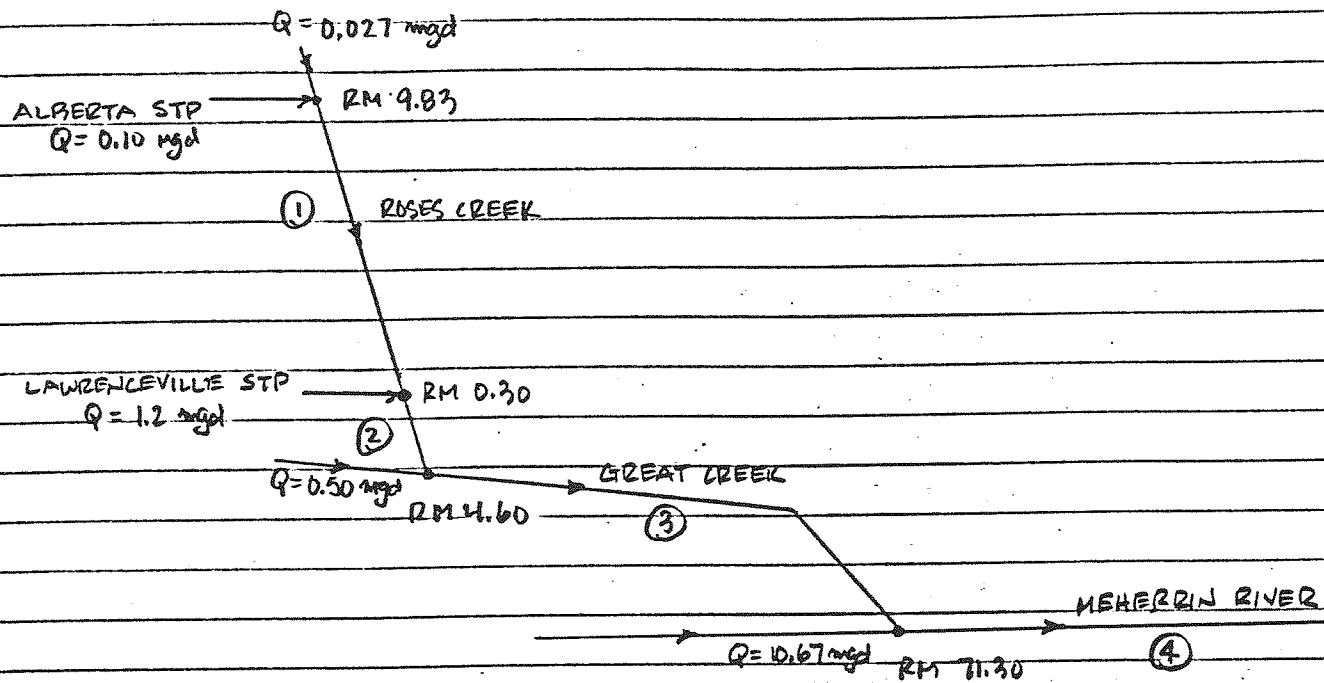
| | |
|-------------------|-------------|
| Q | = 0.1 mgd |
| cBOD ₆ | = 12.0 mg/l |
| TKN | = 3.0 mg/l |
| DO | = 6.5 mg/l |

Wet Season, High Flow (January-April)

| | |
|-------------------|--------------------|
| Q | = 0.1 mgd |
| cBOD ₆ | = 25.0 mg/l |
| TKN | No limit necessary |
| DO | = 5.0 mg/l |

Full model documentation, including a model schematic, pertinent calculations, a copy of the topographic map showing the discharge locations, and pertinent information from other sources is included as the attachment to this memorandum. An electronic copy of the model, input file, and results can be obtained by contacting the author.

If you have any questions or require additional information related to this modeling effort, please do not hesitate to contact the PRO Planning Unit.

MODEL SCHEMATIC

PRO

MEMORANDUM

30317
32523
32524
32525
32526
32527
32528
32529
32530

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
Water Quality Assessments and Planning
P.O. Box 10009 Richmond, Virginia

Was all
this attached
this memo?

Frequency Determination
Lawrenceville STP - VA#0020354

to Jon's flow
Lawrenceville PRO

It looks like Osborne-Cook, PRO
unnecessary to include Herman, WQAP, Paul

Date: March 6, 1996

COPIES: Ron Gregory, Charles Martin, File

The Lawrenceville STP discharges to the Roses Creek near Lawrenceville, VA. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit.

The VDEQ operated a continuous record gage on the Great Creek near Cochran, VA (#02051600) from 1958 to 1986. The gage was located at the Route 618 bridge in Brunswick County, VA. The flow frequencies for the gage and the discharge point are presented below. The values at the discharge point were determined by drainage area proportions and do not address any withdrawals, discharges, or springs lying upstream.

Great Creek near Cochran, VA (#02051600):

| | |
|--------------------------------------|---------------------------|
| Drainage Area = 30.7 mi ² | 0.017 cfs/mi ² |
| 1Q10 = 0.38 cfs | High Flow 1Q10 = 6.8 cfs |
| 7Q10 = 0.52 cfs | High Flow 7Q10 = 7.8 cfs |
| 30Q5 = 1.7 cfs | HM = 7.1 cfs |

Roses Creek at Lawrenceville STP discharge point:

| | |
|---------------------------------------|--------------------------|
| Drainage Area = 27.42 mi ² | Jlm-Apr |
| 1Q10 = 0.34 cfs | High Flow 1Q10 = 6.1 cfs |
| 7Q10 = 0.46 cfs | High Flow 7Q10 = 7.0 cfs |
| 30Q5 = 1.5 cfs | HM = 6.3 cfs |
| | 3.94 |
| | 4.52 |
| | 4.07 |

The high flow months are January through April. If you have any questions concerning this analysis, please let me know.

MEMORANDUM
DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
Office of Water Resources Management
4900 Cox Road P. O. Box 11143 Richmond, Virginia 23230

SUBJECT: Flow Frequency Determination
Town of Alberta STP - #VA0026816

TO: D. X. Ren, PRO

FROM: Paul Herman, OWRM-WQAP *Paul*

DATE: April 23, 1993

COPIES: Ron Gregory, Charles Martin, Dale Phillips, Curt Wells,
Mark Richards, File



The Town of Alberta STP discharges to Roses Creek near Cochran, VA. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit.

The VWCB operated a continuous record gage on Great Creek near Cochran, VA (#02051600) from 1958-1986. The gage is approximately 2.25 miles southwest of the discharge point. The flow frequencies for the gage and the discharge point are presented below. The values at the discharge point were determined by drainage area proportions.

Great Creek near Cochran, VA (#02051600):

| | |
|----------------------|-----------------|
| Drainage Area = 30.7 | mi ² |
| 1Q10 = 0.38 | cfs |
| 7Q10 = 0.52 | cfs |
| High Flow 7Q10 = 7.8 | cfs |
| 30Q5 = 1.7 | cfs |
| HM = 7.1 | cfs |

Roses Creek at discharge point:

| | |
|-----------------------|-----------------|
| Drainage Area = 2.43 | mi ² |
| 1Q10 = 0.03 | cfs |
| 7Q10 = 0.04 | cfs |
| High Flow 7Q10 = 0.62 | cfs |
| 30Q5 = 0.13 | cfs |
| HM = 0.56 | cfs |

This analysis does not account for any springs, withdrawals or discharges that may be present upstream of the discharge point.

If you have any questions concerning this analysis, please let me know.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
Water Quality Assessments and Planning
629 E. Main Street P.O. Box 10009 Richmond, Virginia 23240

SUBJECT: Flow Frequency Determination - Amendment
Town of Alberta STP - VA#0026816

TO: Diane Osborne, PRO

FROM: Paul Herman, OWRM-WQAP *Paul*

DATE: December 21, 1993

COPIES: Ron Gregory, Charles Martin, Dale Phillips, Curt Wells,
D.X. Ren, File

Per your request, I am providing the 1Q10 and 7Q10 flow frequencies for the low temperature months November through April and also the 1Q10 for the high flow months of January through April. The flow frequencies for the reference gage and the discharge point are listed below.

Great Creek near Cochran, VA (#02051600):

Drainage Area = 30.7 mi²

1Q10 = 3.22 cfs (November - April)

7Q10 = 3.67 cfs (November - April)

High Flow 1Q10 = 6.8 cfs (January - April)

Roses Creek at discharge point:

Drainage Area = 2.43 mi²

1Q10 = 0.25 cfs (November - April)

7Q10 = 0.29 cfs (November - April)

High Flow 1Q10 = 0.54 cfs (January - April)

If you have any questions concerning the amended flow frequencies listed above please let me know.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
Water Quality Assessments and Planning
629 E. Main Street P.O. Box 10009 Richmond, Virginia 23240

SUBJECT: Flow Frequency Determination
Lawrenceville STP - VA#0020354

TO: Diane Osborne-Cook, PRO

FROM: Paul Herman, WQAP

DATE: March 6, 1996

COPIES: Ron Gregory, Charles Martin, File

This memo is an addition to my earlier memo on the subject dated March 6, 1996.

Additional flow data has been requested for the Meherrin River above its confluence with the Great Creek. This analysis of the Meherrin River used the USGS continuous record gage on the Meherrin River near Lawrenceville, VA (#02051500) which has been operating since 1929. The flows for the Meherrin River above its confluence with the Great Creek were determined using drainage area proportioning. The flows for the gaging station and the point of evaluation are provided below.

Meherrin River near Lawrenceville, VA (#02051500):

Drainage Area = 552 mi²

| | |
|---------------|--------------------------|
| 1Q10 = 13 cfs | High Flow 1Q10 = 93 cfs |
| 7Q10 = 16 cfs | High Flow 7Q10 = 118 cfs |
| 30Q5 = 38 cfs | HM = 139 cfs |

Meherrin River above Great Creek:

Drainage Area = 568.62 mi²

| | |
|-----------------|----------------------------|
| 1Q10 = 13.4 cfs | High Flow 1Q10 = 95.8 cfs |
| 7Q10 = 16.5 cfs | High Flow 7Q10 = 121.6 cfs |
| 30Q5 = 39.1 cfs | HM = 143.2 cfs |

The drainage area of the Great Creek at its mouth is 84.68 mi². The high flow months for the Meherrin River are January through April. If flows are needed for the Great Creek please refer to my March 6th memo which contains the flow frequencies for the Great Creek gage.

If you have any questions or require additional information, please give me a call.

LOW FLOW CONDITIONS
DATA PREPARATION WORKSHEET

(This Page is Needed Once for Each Model)

Site Inspection Performed? (Y/N)

Y

Name of Receiving Stream

ROSES CREEK (SA RSE)

River Basin

CHOWAN (MEHERZIN)

Section

3

Classification

III

Are Standards Violated Due to Natural Causes? (Y/N)

N

Class and Standards Appropriate for the Stream? (Y/N)

Y

Is There a Dam in the Reach to be Modeled? (Y/N)

N

Is There a Discharge Within 3 Miles of Model Start? (Y/N)

N

If "Y": Flow of Upstream Discharge (MGD)

BOD₅ at Model Start (Mg/l)

TKN at Model Start (Mg/l)

D.O. at Model Start (Mg/l)

Name of Discharge Being Modeled

ALBERTA STP (VA0026816)

Flow

0.1 mgd

cBOD₅

0.0 mg/l

TKN

3.0 mg/l

D.O.

5.0 mg/l

Number of Segments to be Modeled?

4

7Q10 Estimation Method Code

1

(1 = Drainage Area Comparison; 2 = Flow Comparison)

Name of Gauge Used to Estimate 7Q10

WNCB # 02051600

If Method 1: Gauge Drainage Area (Sq.Mi.)

30.7

Gauge 7Q10 (MGD)

0.336

Drainage Area at Discharge (Sq.Mi.)

2.43

If Method 2: Gauge 7Q10 (MGD)

Observed Flow at Gauge (MGD)

Observed Flow at Discharge Point (MGD)

Is the Stream a Dry Ditch? (Y/N)

N

Does Antidegradation Apply? (Y/N)

N

Allocation Temperature for the Model (°C)

(Based on STORET 90th percentile temperature)

Model File Disk Directory and Name

C:\MODELS\STREAM\
ALBERTA.MOD

Modeler and Date

Jon van Soestbergen 4/4/96

SEGMENT DATA PREPARATION WORKSHEET

(This Page is Needed for Each Separate Segment Being Modeled)

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| 3 | 1 | 1 | 4 |

Segment Definition Code

- 1 = A Tributary Enters at the Segment End
 2 = A Significant Physical Change Occurs at Segment End
 3 = Another Discharge Enters at Segment End
 4 = The Model Ends

Length of Segment (Mi.)

SEGMENT ②

9.53 0.30 4.60 5.00

- (a): Enter Flow Estimated During Inspection (MGD)
 (b): Enter 7Q10 at Model Start (Include Discharge) (MGD)
 (c): Calculate the Flow Ratio (a/b)

| |
|--------------|
| <u>19.4</u> |
| <u>1.50</u> |
| <u>0.077</u> |

(see site inspection summary)
 (1.2 + 0.600 (0.46))

| 1.0 | 5.0 | 5.0 | 20 |
|------|------|-----|-----|
| 0.17 | 0.6 | 0.8 | 2.0 |
| 0.63 | 0.75 | 0.8 | 0.5 |

Estimated 7Q10 Width (Ft.)②1.0 5.0 5.0 20**Estimated 7Q10 Depth (Ft.)**

| |
|-------------|
| <u>1.45</u> |
| <u>1.50</u> |

0.17 0.6 0.8 2.0**Estimated 7Q10 Velocity (ft/sec)**0.63 0.75 0.8 0.5**Continuity Check:**

- (a): Multiply: Width x Depth x Velocity x 0.6463
 (b): Enter 7Q10 at Model Start (Include Discharge) (MGD)

| |
|-------------|
| <u>1.45</u> |
| <u>1.50</u> |

If the two numbers above differ by much, there is an error

Review your data and revise your estimates

Drainage Area at the Beginning of This Segment (Sq.Mi.)2.43 27.92 45.74 653.30**Drainage Area at the End of This Segment (Sq.Mi.)**27.42 27.49 57.19 740.15

Omit drainage area of "Tributary at End" section

Elevation at the Beginning of This Segment (Ft.)289.5 162.3 159.0 137.0**Elevation at the End of This Segment (Ft.)**162.3 159.0 137.0 128.0

SEGMENT DATA PREPARATION WORKSHEET

Type of Cross Section

- 1 = Rectangular; 2 = Triangular; 3 = Deep Narrow U; 4 = Wide Shallow Arc
 5 = Irregular; 6 = No Defined Channel

1 2 3 4

General Character of Stream

- 1 = Mostly Straight; 2 = Moderately Meandering; 3 = Severely Meandering
 4 = No Defined Channel

2 2 2 1

Does This Segment Have a Pool and Riffle Character? (Y/N)

- If "Y": Percent of Length That is Pools/100 _____
 Percent of Length That is Riffles/100 _____
 Estimated Average Depth of Pools (FL) _____
 Estimated Average Depth of Riffles (FL) _____

N N H N

Check that this is reasonable with the overall depth you entered earlier:

- (a): Enter the 7Q10 Depth (FL) from previous page _____
 (b): Enter % Pool Length x Pool Depth _____
 (c): Enter % Riffle Length x Riffle Depth _____
 (d): Enter (b+c)/100 _____

The values in (a) and (d) should be the same or very close

General Bottom Type

- 1 = Sand; 2 = Silt; 3 = Gravel; 4 = Small Rock; 5 = Large Rock; 6 = Boulders

1 1 1 1

Sludge Deposits (organic sludge from malfunctioning STP)

- 1 = None; 2 = Few; 3 = Light; 4 = Heavy

1 1 1 1

Plants (Submerged macrophytes or rooted plants in waterway)

- 1 = None; 2 = Few; 3 = Light; 4 = Heavy

1 1 1 1

Algae (Visually evident algae growth in water)

- 1 = None; 2 = Only on Edges; 3 = On Entire Bottom

1 1 1 1

Does the Water Have an Evident Green Color? (Y/N)

Indication of phytoplankton

N N H N

Tributary at End

Tributary Drainage Area (Sq.Mi.)

2 3

45.74 568.62

N Y Y N

Tributary Flow (MGD) (Tributary D.A. x Gauge 7Q10/Gauge D.A.)

— 0.50 10.67

Discharge at End

Discharge Name

Section 1

Lancasterville STP

Discharge Flow (MGD)

1.2

Discharge BOD5 (Mg/l)

4.0

Discharge TKN (Mg/l)

3.0

Discharge D.O. (Mg/l)

5.0

HIGH FLOW CONDITIONS DATA PREPARATION WORKSHEET

(This Page is Needed Once for Each Model)

Site Inspection Performed? (Y/N) Y

Name of Receiving Stream
 River Basin
 Section
 Classification

ROSES CREEK (SA2SE)
CHOWAN (MEKEZIN)
3
III

Are Standards Violated Due to Natural Causes? (Y/N)
 Class and Standards Appropriate for the Stream? (Y/N)
 Is There a Dam in the Reach to be Modeled? (Y/N)

N
Y
N

Is There a Discharge Within 3 Miles of Model Start? (Y/N)

If "Y": Flow of Upstream Discharge (MGD)
 BOD₅ at Model Start (Mg/l)
 TKN at Model Start (Mg/l)
 D.O. at Model Start (Mg/l)

N

Name of Discharge Being Modeled

Flow
 cBOD₅
 TKN
 D.O.

ALBERTA STP (VADD 26816)
0.1
25.0
20.0
5.0

Number of Segments to be Modeled? 4

7Q10 Estimation Method Code
 (1 = Drainage Area Comparison; 2 = Flow Comparison)

1

Name of Gauge Used to Estimate 7Q10
If Method 1: Gauge Drainage Area (Sq.Mi.)
 Gauge 7Q10 (MGD)
 Drainage Area at Discharge (Sq.Mi.)
If Method 2: Gauge 7Q10 (MGD)
 Observed Flow at Gauge (MGD)
 Observed Flow at Discharge Point (MGD)

VDEQ # 02.051600
30.7
5.04
2.43

Is the Stream a Dry Ditch? (Y/N)

N

Does Antidegradation Apply? (Y/N)

N

Allocation Temperature for the Model (°C)

12.4

(Based on STORET 90th percentile temperature)

C:\MODELS\STREAM\
ALBRHIGH.MOD

Model File Disk Directory and Name

JON VAN SOESTBERGEN

Modeler and Date

SEGMENT DATA PREPARATION WORKSHEET

(This Page is Needed for Each Separate Segment Being Modeled)

HIGH FLOW CONDITIONS

| SEGMENT NO. | 1 | 2 | 3 | 4 |
|-------------|---|---|---|---|
|-------------|---|---|---|---|

| | | | |
|---|---|---|---|
| 3 | 1 | 1 | 4 |
|---|---|---|---|

Segment Definition Code

- 1 = A Tributary Enters at the Segment End
- 2 = A Significant Physical Change Occurs at Segment End
- 3 = Another Discharge Enters at Segment End
- 4 = The Model Ends

Length of Segment (Mi.)

| | | | |
|-------------|-------------|-------------|----------|
| <u>9.53</u> | <u>0.30</u> | <u>4.60</u> | <u>5</u> |
|-------------|-------------|-------------|----------|

| |
|--------------|
| <u>9.4</u> |
| <u>1.60</u> |
| <u>0.077</u> |

Estimated 7Q10 Width (Ft.)

| | | | |
|------------|------------|------------|------------|
| <u>2.0</u> | <u>9.5</u> | <u>9.5</u> | <u>3.2</u> |
|------------|------------|------------|------------|

Estimated 7Q10 Depth (Ft.)

| | | | |
|------------|------------|------------|------------|
| <u>0.3</u> | <u>1.0</u> | <u>1.5</u> | <u>2.1</u> |
|------------|------------|------------|------------|

Estimated 7Q10 Velocity (ft/sec)

| | | | |
|------------|-------------|------------|------------|
| <u>1.0</u> | <u>0.75</u> | <u>1.0</u> | <u>1.1</u> |
|------------|-------------|------------|------------|

Continuity Check:

- (a): Multiply: Width x Depth x Velocity x 0.6463
- (b): Enter 7Q10 at Model Start (Include Discharge) (MGD)

If the two numbers above differ by much, there is an error

Review your data and revise your estimates

Drainage Area at the Beginning of This Segment (Sq.Mi.)

| | | | |
|-------------|--------------|--------------|-----------|
| <u>2.43</u> | <u>27.42</u> | <u>45.74</u> | <u>65</u> |
|-------------|--------------|--------------|-----------|

Drainage Area at the End of This Segment (Sq.Mi.)

| | | | |
|--------------|--------------|--------------|-----------|
| <u>27.42</u> | <u>27.49</u> | <u>57.19</u> | <u>74</u> |
|--------------|--------------|--------------|-----------|

Omit drainage area of "Tributary at End" section

Elevation at the Beginning of This Segment (Ft.)

| | | | |
|--------------|--------------|--------------|-----------|
| <u>289.5</u> | <u>162.3</u> | <u>159.0</u> | <u>13</u> |
|--------------|--------------|--------------|-----------|

Elevation at the End of This Segment (Ft.)

| | | | |
|--------------|--------------|--------------|-----------|
| <u>162.3</u> | <u>159.0</u> | <u>137.0</u> | <u>12</u> |
|--------------|--------------|--------------|-----------|

1 2 3 4

SEGMENT DATA PREPARATION WORKSHEET**Type of Cross Section**

- 1 = Rectangular; 2 = Triangular; 3 = Deep Narrow U; 4 = Wide Shallow Arc
 5 = Irregular; 6 = No Defined Channel

 2221**General Character of Stream**

- 1 = Mostly Straight; 2 = Moderately Meandering; 3 = Severely Meandering
 4 = No Defined Channel

Does This Segment Have a Pool and Riffle Character? (Y/N)

- If "Y": Percent of Length That is Pools/100 _____
 Percent of Length That is Riffles/100 _____
 Estimated Average Depth of Pools (Ft.) _____
 Estimated Average Depth of Riffles (Ft.) _____

NNNH

Check that this is reasonable with the overall depth you entered earlier:

- (a): Enter the 7Q10 Depth (Ft.) from previous page _____
 (b): Enter % Pool Length x Pool Depth _____
 (c): Enter % Riffle Length x Riffle Depth _____
 (d): Enter (b+c)/100 _____

The values in (a) and (d) should be the same or very close

General Bottom Type

- 1 = Sand; 2 = Silt; 3 = Gravel; 4 = Small Rock; 5 = Large Rock; 6 = Boulders

 Sludge Deposits (organic sludge from malfunctioning STP)

- 1 = None; 2 = Few; 3 = Light; 4 = Heavy

 Plants (Submerged macrophytes or rooted plants in waterway)

- 1 = None; 2 = Few; 3 = Light; 4 = Heavy

 Algae (Visually evident algae growth in water)

- 1 = None; 2 = Only on Edges; 3 = On Entire Bottom

 Does the Water Have an Evident Green Color? (Y/N)

Indication of phytoplankton

NNNH**Tributary at End**

Tributary Drainage Area (Sq.Mi.)

23
45.74568.62

- Tributary Flow (MGD) (Tributary D.A. x Gauge 7Q10/Gauge D.A.)

NYYH-7.5178.6-**Discharge at End****Section 1**

Discharge Name

Lawrenceville STP

Discharge Flow (MGD)

1.2

Discharge BOD5 (Mg/l)

21.0

Discharge TKN (Mg/l)

20.0

Discharge D.O. (Mg/l)

6.5

ALBERTA / LAWRENCEVILLE MOSE

04-04-26

SEGMENT 1 (ALBERTA TO LAWRENCEVILLE)

ALBERTA DISCHARGE:

R.M. = 5A25E007.83 (FROM WQMD DATABASE)

ELEV. = 289.5 (FROM GLINDEMAN E-MAIL 4.4.96)

D.A. = 2.43 mi² (FROM P. HEBMAN MEMO 4.23.93)

7Q10 = 0.04 cfs

$$Q_2 = 0.04 + (0.1 \text{ mfd} \times 10.646) = 0.1046 \text{ cfs}$$

ESTIMATE 7Q10 WIDTH = 1.0 FT

DEPTH = 2.0" = 0.17 FT

$$7Q10 VEL. = \frac{0.1046}{0.17 \times 1.0} = 0.63 \text{ fps}$$

LAWRENCEVILLE STP (VA0020554)

CALCULATIONS. p. 1/2

ROSES CREEK MODEL. 3-21-96

DRAINAGE AREA CALCULATIONS

① ROSES CREEK:

DRAINAGE AREA @ STP DISCHARGE = 27.42 mi^2 (FROM P. HERMAN MEMO 3-10-96)
DRAINAGE AREA @ MOUTH = 27.49 mi^2 (FROM GAZETTEER)

② GREAT CREEK:

DRAINAGE AREA @ GAUGE 02051600 = 30.70 mi^2 (P. HERMAN MEMO 3-6-96)
DRAINAGE AREA @ DAM = $26,074 \text{ ac.} = 40.74 \text{ mi}^2$ (DRAFT PLAN # EIS 10-75, p. I-1)
DRAINAGE AREA @ MOUTH = 34.68 mi^2 (FROM GAZETTEER)
DRAINAGE AREA @ ROSES CREEK = 45.74 mi^2 (ESTIMATED FROM PROJECT MAP # 1 -
PLAN # EIS - 5 mi^2 BELOW DAM)

DRAINAGE AREA FOR HATCHES:

BEGIN SEGMENT 1 : 27.42 mi^2

END SEGMENT 1 : 27.49 mi^2

BEGIN SEGMENT 2 : 45.74 mi^2

END SEGMENT 2 : $34.68 - 27.49 = 57.19 \text{ mi}^2$ (TOTAL GREAT CR. - TOTAL ROSES

ELEVATIONS

① ROSES CREEK:

ROSES CREEK @ STP DISCHARGE: $153.0 + 0.3(5280)(0.002105) = 162.35'$ (SLOPE FWD
NOSEL 1.5%)
ROSES CREEK @ MOUTH: $153.0'$ (FROM GAZETTEER)

② GREAT CREEK:

GREAT CREEK @ ROSES CREEK : $159.0'$

GREAT CREEK @ MEPECRIN : $137'$ (DRAFT PLAN # EIS, p. I-29)

LAWRENCEVILLE STO (VA0020354)

CALCULATIONS. p. 2/2

ROSES CREEK MODEL 3.21.96

TRIBUTARY FLOW CALCULATIONS

FLOW IN GREAT CREEK @ ROSES CREEK CONFLUENCE.

$$TQID @ GAUGE 02051600 = 0.52 \text{ cfs}$$

$$\text{DRAINAGE AREA @ GAUGE} = 30.7 \text{ mi}^2$$

$$\text{INCREMENTAL FLOW} = \frac{0.52 \text{ cfs}}{30.7 \text{ mi}^2} = 0.0169 \text{ cfs/mi}^2$$

DRAINAGE AREA @ ROSES = 45.74 mi² (FROM DRAINAGE AREA CALCULATIONS).

$$TQID @ ROSES = 45.74 \text{ mi}^2 \times 0.0169 \frac{\text{cfs}}{\text{mi}^2} = 0.77 \text{ cfs} \times 0.640 \frac{\text{mgd}}{\text{cfs}} = 0.50 \text{ mgd}$$

$$\text{TRIBUTARY FLOW} = \underline{0.50 \text{ mgd}}$$

NEHERRIN FLOW FROM NRAP 3/6/96 MEMO: 16.5 cfs = 10.67 mgd

SEGMENT LENGTHS

DETERMINED FROM USGS POWELLTON QUADRANGLE AS FOLLOWS:

SEGMENT ① RSE 000.30 - RSE 000.00 (0.3 miles)

SEGMENT ② GRT 004.60 - GRT 000.00 (4.6 miles)

MILEAGES CHECKED AGAINST GAZETTEER (SEGMENT 2) AND PERMIT DATABASE (WQMP, OUTLINE TABLE). BOTH NUMBERS CHECK (4.60, 0.28, RESPECTIVELY).

SEGMENT ① RSE 9.83 - RSE 0.30 = 9.53

SEGMENT ④ NHN 71.3 - 66.3 (5.0 miles)

ALBERTA / LAWRENCEVILLE MODEL - ROSES CREEK

4-4

MEHERZIN RIVER CALCULATIONS FOR SEGMENT NO. 4

1. TRIBUTARY FLOW

- MEHERZIN RIVER ABOVE GREAT CREEK

FROM PAUL HERMAN 03.06.96 MEMORANDUM

$$Q = 16.5 \text{ cfs} \times 0.6464 = 10.67 \text{ mgd}$$

2. DRAINAGE AREA

| | | | |
|--|--------------|-----------------|----------------------------|
| - D.A. MEHERZIN TOTAL | 1,017.98 | mi ² | (GAZETTER) |
| - D.A. MEHERZIN ABOVE GREAT CR. | 568.62 | mi ² | (P. HERMAN MEMO 3.6.96) |
| - D.A. GREAT CREEK | <u>84.68</u> | mi ² | (P HERMAN MEMO & GAZETTER) |
| = D.A. MEHERZIN BELOW GREAT CR. 364.68 | | | |

$$R.M. GREAT CREEK CONFLUENCE = 71.3$$

$$D.A. / R.M. BELOW GREAT CREEK = \frac{364.68}{71.3} = 17.366 \frac{\text{mi}^2}{\text{mi}}$$

$$D.A. AT BEGINNING OF SEGMENT = 568.62 + 84.68 = \underline{653.30}$$

$$D.A. AT END OF SEGMENT = 653.30 + 5(17.366) = \underline{740.13}$$

INCREMENTAL FLOW CHECK

GREAT CREEK GAUGE (02051600) : 0.92 cfs / 30.7 mi² = 0.0169 cfs/mi²

MEHERZIN 2 GAUGE (02051500) : 16.0 cfs / 552.0 mi² = 0.0290 cfs/mi²

3. ELEVATIONS

- AT BEGINNING OF SEGMENT : 137.0 (DRAFT PLAN # EIS, p II-29)
- AT END SEGMENT : 128.0

| FROM GAZETTER : | R.M. | ELEV | |
|-----------------|------|------|---|
| | 31.5 | 74 | SLOPE = $\frac{146 - 74}{71.3 - 31.5} = 1.80 \frac{\text{ft}}{\text{mile}}$ |
| | 71.3 | 146 | |

$$\Delta \text{ELEV SEGMENT } 4 = 137.0 - 5(1.80) = 128.0$$

ALBERTA / LAWRENCEVILLE MODEL - ROSES CREEK

4.10.96

ALLOCATION TEMPERATURE CALCULATION (YEAR-ROUND CONDITIONS)

AQM STATION: 5AGTC005.40 (GREAT CREEK @ RTE. 713 BRIDGE)

DATA SOURCE: STORED RETRIEVAL 01/90 - 05/95 DATE OF RETRIEVAL 06.29.95

| DATE | T (°C) | X _i - μ | (X _i - μ) ² |
|----------|--------|--------------------|-----------------------------------|
| 08/13/90 | 2.5 | -11.17 | 124.85 |
| 11/27/90 | 9.3 | -3.87 | 15.01 |
| 02/12/91 | 5.0 | -8.67 | 75.23 |
| 05/23/91 | 21.4 | 7.73 | 59.70 |
| 08/20/91 | 24.3 | 11.13 | 123.79 |
| 11/25/91 | 9.9 | -3.77 | 14.24 |
| 02/25/92 | 9.3 | -3.87 | 15.01 |
| 05/20/92 | 17.1 | 3.42 | 11.74 |
| 08/20/92 | 21.8 | 8.13 | 66.04 |
| 11/12/92 | 12.4 | -1.27 | 1.62 |
| 02/17/93 | 6.4 | -7.27 | 52.91 |
| 05/17/93 | 21.1 | 7.43 | 55.15 |
| 11/15/93 | 15.3 | 1.63 | 2.64 |
| 02/16/94 | 5.7 | -7.97 | 63.58 |
| 05/12/94 | 18.3 | 5.13 | 26.28 |
| 07/13/94 | 25.4 | 11.73 | 137.51 |
| 10/19/94 | 12.8 | -0.87 | 0.76 |
| 01/11/95 | 5.6 | -8.07 | 65.18 |
| 04/24/95 | 14.2 | 0.53 | 0.28 |

$$n = 19 \quad \sum 259.8 \quad \sum 911.52$$

$$\mu = \frac{\sum x_i}{n} = \frac{259.8}{19} = 13.67$$

$$\sigma^2 = \frac{\sum (x_i - \mu)^2}{n-1} = \frac{911.52}{18} = 50.64$$

$$T_{90} = \mu + z_{90} \sigma \quad (z_{90} = 1.282) \quad \sigma = 7.12$$

$$T_{90} = 13.67 + 1.282 (7.12)$$

$$\underline{T_{90} = 22.8^\circ C}$$

LAWRENCEVILLE STP (VA0020354)
 ROSES CREEK MODEL 3.21.96
 HIGH FLOW CONDITIONS

HIGH FLOW CALCULATIONS p. 11

TRIBUTARY FLOW CALCULATIONS (GREAT CREEK)

GAUGE TQ10 = 7.8 cfs (PAUL HEEMAN MEMO 03.06.96)

GREAT CREEK DRAINAGE AREA = 45.74 mi²

INCREMENTAL FLOW = 7.8 cfs / 30.7 mi² = 0.254 cfs/mi²

TRIBUTARY FLOW = 45.74 mi² × 0.254 cfs/mi² × 0.646 mgd/cfs

$$Q = 7.51 \text{ mgd}$$

MEHERRIN FLOW FROM 3/16/96 WQRP MEMO: 121.6 cfs = 78.6 mgd

HIGH TQ10 CHANNEL DIMENSIONS (ESTIMATED BASED ON FLOW AND SITE INSPECTION)

| ① LAWRENCEVILLE ROSES CREEK | ② GREAT CREEK | ③ ROSES CREEK | ④ MEHERRIN |
|--------------------------------|---------------|---------------|------------|
| WIDTH (ft) | 9.5 | 9.5 | 2.0 |
| DEPTH (ft) | 1.0 | 1.5 | 0.3 |
| VELOCITY (fps) | 0.75 | 1.0 | 1.0 |
| FLOW (cfs) | 7.1 | 14.3 | 0.62 |
| | (2) | (3) | (4) |

ALLOCATION TEMPERATURE

ADM STATION: 5AGTC005.40 (RTE. 713 BRIDGE)

HIGH FLOW MONTHS: JAN - APRIL

DATA SOURCE: STORET RETRIEVAL 01/90 - 05/95

DATE OF RETRIEVAL 06.29.95

| DATE | T (°C) | X _i - μ | (X _i - μ) ² |
|----------|--------|--------------------|-----------------------------------|
| 02/12/91 | 5.0 | -2.78 | 7.73 |
| 02/25/92 | 9.8 | 2.02 | 4.08 |
| 02/17/93 | 6.4 | -1.38 | 1.90 |
| 02/16/94 | 5.7 | -2.08 | 4.33 |
| 01/11/95 | 5.6 | -2.18 | 4.75 |
| 04/24/95 | 14.2 | 6.42 | 41.22 |
| | | | Σ 64.01 |

$$\bar{x} = \frac{\sum x_i}{n} = \frac{64.01}{6} = 10.67$$

$$\begin{aligned} \sigma^2 &= \frac{\sum (x_i - \bar{x})^2}{n-1} \\ &= \frac{41.22}{6-1} = 8.24 \\ \sigma &= \sqrt{8.24} = 2.87 \end{aligned}$$

$$\begin{aligned} T_{AD}^{90\%} &= \mu + z_p \sigma \\ &= 10.67 + 1.282(2.87) \\ &= 14.78 \end{aligned}$$

$$\underline{T_{AD}} = 12.4^\circ\text{C}$$

STREAM INSPECTION REPORT FORM

PAGE 1

Discharge Name: TOWN OF LAWRENCEVILLE MUNICIPAL STP (YACOD20254)
Location: LAWRENCEVILLE, VA, WATERBODY YAP-KOTR, HUC 03010204

General Stream Information:Stream Name: ROSES CREEK, DISCHARGE AT BARSEDOM.28Topographic Map (attach copy): POWELLTON (009A) see AttachedBasin: CHOWAN (MEHERIN) Section: 3 Class: III Special Standards: NAre the standards for this stream violated due to natural causes? (Y/N) NIs this stream correctly classified? (Y/N) YIf "N", what is the correct classification? -Additional Discharges Information:Is there a discharger within 3 miles upstream of the proposal? (Y/N) NDoes antidegradation apply to this analysis? (Y/N) NAny dams in stream section being modeled? (Y/N) NNotes:

- Roses Creek was modeled on 10/15/87 for a discharge of 0.7 mgd from the Lawrenceville 67 CSOYXSA6 model was used.
- Lawrenceville has multipurpose impoundment (flood control, public water supply) on Great Creek about 5 miles upstream of the confluence with Roses Creek.
- The Draft Plan and Draft Environmental Impact Statement, Great Creek Watershed, Brunswick and Lunenburg Counties, Southside Soil & Water Conservation District, et al., October 1978, was reviewed for this model.

Pertinent information:

- Downstream release rate equal to 7Q10 flow (p. I-10)
- Elevation Great Creek @ Meherrin River = 137' (p. II-21)
- Drainage area @ dam = 26,074 acres. (project map., p. I-12)

- Site visit summary schematic (1 page) included as attachment to this form.
- Information for both segments is provided on single p. 2 of this form.
- Some pools & riffles were observed in stream during inspection. However, there were not enough to characterize the stream as having a pool/riffle character.

Inspected by JON VAN SOESTBERGEN Date 03-14-96 Region PEO
DIVINE COOK (PERMIT WRITER)

STREAM INSPECTION REPORT FORM

PAGE 2

(Fill In This Page for Each Segment To Be Modeled)

Specific Stream Information From Field Inspection: Segment Number ①, ②Reason for Defining Segment: Tributary at End 1 Physical Change at End _____
Discharge at End _____ End of Model 2 ① ②Length of Segment (mi.) 0.3 4.6Estimated Average Width of Section (ft.) 20 20Estimated Average Depth of Section (ft.) in Stream Center 1.5 2.0Estimated Average Velocity of Section (ft/sec) 1.0 1.5Estimated Flow in the Segment (MGD) 16.4 38.9General Type of Cross Section in Segment: Rectangular 1, 2 Triangular _____ Deep Narrow U _____ Wide Shallow Arc _____
Irregular _____ No Defined Channel _____

General Channel Characteristics of Segment:

Mostly Straight _____ Moderately Meandering 1, 2 Severely Meandering _____ No Defined Channel _____Does the stream have a pool and riffle character? (Y/N) N, N

If "Y": % of length that is pools _____ Average depth of pools (ft) _____

% of length that is riffles _____ Average depth of riffles (ft) _____

Bottom: Sand 1, 2 Silt _____ Gravel _____ Small Rock _____ Large Rock _____ Boulders _____Sludge Deposits: None 1, 2 Trace _____ Light _____ Heavy _____Plants: Rooted: None 1, 2 Few _____ Light _____ Heavy _____Algae: None 1, 2 Film on Edges Only _____ Film on Entire Bottom _____Does the water have an evident green color? (Y/N) N, N

Tributary: (Fill in if a tributary enters at the end of the segment)

Tributary Name: GREAT CREEKWidth (ft) 20 Depth (ft) 2.0 Estimated Flow (MGD) 38.3Any evident Water Quality problems in the Trib.? (Y/N) NIf "Y", explain: _____

Discharges: (Fill in if a discharge enters at the end of the segment)

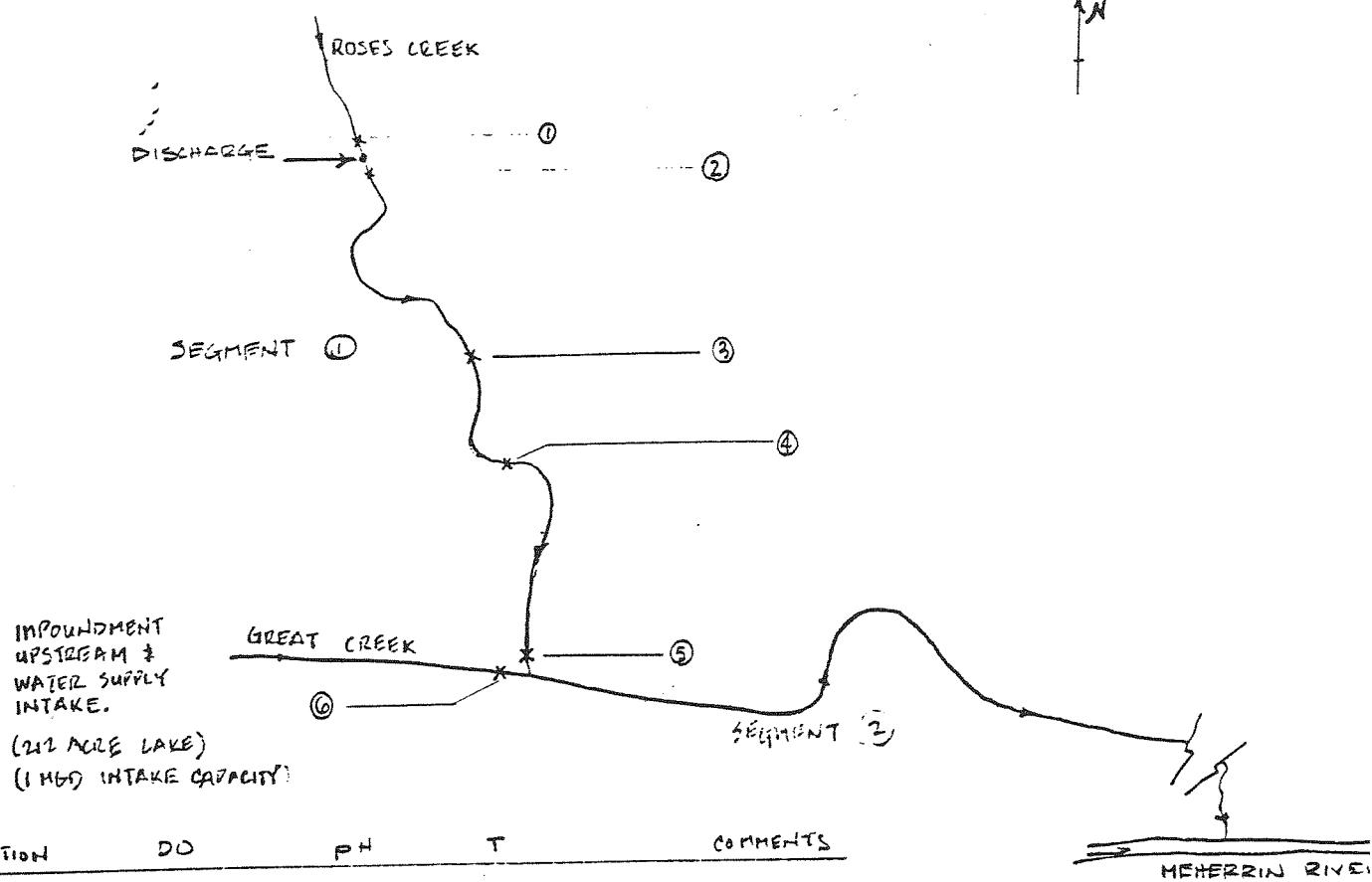
Discharge Name: N/A

Any evident problems caused by this discharge? (Y/N) _____

If "Y", explain: _____

DATE OF SITE VISIT: 03/14/96
PERFORMED BY: JON VAN SOESERGEN
DIANE COOK.

(VA 0020354)
ROSES CREEK



| LOCATION | DO | pH | T | COMMENTS |
|----------|------|------|-----|----------|
| 1 | 9.45 | - | - | |
| 2 | 8.50 | - | - | |
| 3 | 9.40 | - | - | |
| 4 | 9.18 | - | - | |
| 5 | 9.36 | 8.20 | 8.8 | |
| 6 | 9.20 | 7.80 | 11 | |

WEATHER: SUNNY, ± 65° F

(ONE OF FIRST NICE DAYS OF SPRING, WATER STILL COLD)

| INSPECTION | 7Q10 | 7Q10 FLOW ESTIMATES INCLUDE DISCHARGE. (1.2 mgd) |
|-------------------|------|--|
| ROSES CREEK FLOW: | | |
| 20' WIDE | 5' | $20 \times 1.5 \times 1.0 = 30 \text{ cfs} \times 0.646 = 19.4 \text{ mgd}$ (INS) |
| 1.5' DEEP | 0.6' | (ALL MEASUREMENTS ARE VISUAL APPROXIMATIONS) |
| 1.0 FT/SEC | 0.75 | $5 \times 0.6 \times 0.75 = 2.25 \text{ cfs} \times 0.646 = 1.45 \text{ mgd}$ (7Q10) |
| GREAT CREEK: | | |
| 20' WIDE | 5.0' | $20 \times 2.0 \times 1.5 = 60 \text{ cfs} \times 0.646 = 38.8 \text{ mgd}$ (INS) |
| 2.0' DEEP | 0.8' | $5 \times 0.8 \times 0.75 = 3.0 \text{ cfs} \times 0.646 = 1.94 \text{ mgd}$ (7Q10) |
| 1.5 FT/SEC | 0.75 | |

To: Jon VanScoyke; gen4RCHMD & DEC
Cc:
Bcc:
From: Diane G. Osborne & RCHMD & DEC
Subject:
Date: Friday, March 15, 1996 17:23:00 EST
Attach: C:\WP31\DIANE\ATTACH\LAWPENLL
Certify: N
Forwarded by:

Hi, Jon

I have (hopefully) attached the 1992-93 stream monitoring at Lawrenceville
did. If you have any questions at all, please call. I expect to remain here
on Monday if you need more info...

Lawrenzeville's Monitoring of Roses Creek

| Month | Temp | pH | DO upstream | Tot Ammonia | | Temp | pH | DO down | Tot Ammonia |
|-------|------|-----|----------------|-------------|------|------|-----|------------|-------------|
| | | | | upstream | down | | | | |
| Jan92 | 42F | 7.0 | 12.0 | 0.22 | | 43 | 7.1 | 12.0 | 0.90 |
| Feb | 49 | 7.1 | 11.0 | 0.19 | | 50 | 7.1 | 11.2 | 1.44 |
| Mar | 47 | 6.8 | 11.0 | 0.16 | | 48 | 6.8 | 11.1 | 1.59 |
| Apr | 66 | 6.9 | 11.8 | 0.21 | | 66 | 7.0 | 11.7 | 0.85 |
| May | 68 | 6.7 | 9.4 | 0.35 | | 69 | 6.9 | 8.4 | 0.35 |
| Jun | 64 | 6.7 | 9.5 | 0.23 | | 64 | 6.7 | 9.5 | 1.03 |
| Jul | 79 | 6.9 | 8.4 | 0.14 | | 80 | 6.8 | 9.6 | 0.63 |
| Aug | 80 | 7.6 | 8.5 | 0.11 | | 80 | 7.6 | 8.6 | 0.24 |
| Sep | 71 | 6.4 | 7.0 | 0.24 | | 71 | 6.5 | 7.0 | 1.16 |
| Oct | 61 | 6.4 | 9.2 | 0.48 | | 61 | 6.4 | 9.1 | 2.5 |
| Nov | 48 | 6.5 | 10.0 | 0.19 | | 50 | 6.3 | 10.2 | 2.04 |
| Dec | 45 | 6.6 | 10.6 | 0.33 | | 47 | 6.6 | 11.1 | 1.16 |
| | | | | | | | | | |
| Jan93 | 44 | 6.9 | 11.5 | 0.09 | | 45 | 6.8 | 10.8 | 0.24 |
| Feb | 46 | 6.8 | 11.0 | 0.22 | | 46 | 6.7 | 10.8 | 0.22 |
| Mar | 54 | 6.4 | 9.6 | 0.44 | | 54 | 6.8 | 9.8 | 0.74 |
| Apr | 60 | 6.6 | 10.6 | 0.19 | | 61 | 6.7 | 11.1 | 7.33 |
| May | 65 | 6.3 | 8.0 | 0.29 | | 66 | 6.7 | 7.8 | 3.80 |
| Jun | 75 | 6.4 | 7.3 | 0.16 | | 76 | 6.4 | 7.8 | 1.66 |
| Jul | 78 | 7.2 | 7.8 | 0.21 | | 78 | 7.0 | 7.3 | 2.49 |
| Aug | 80 | 6.7 | 7.5 | 0.69 | | 80 | 7.2 | 7.3 | 6.5 |
| Sep | 82 | 6.8 | 7.5 | 6.25 | - | 83 | 7.5 | 8.0 | 7.0 |
| Oct | 62 | 6.5 | 7.1 | 0.13 | | 63 | 6.8 | 6.5 | 6.5 |
| Nov | 53 | 5.5 | 9.1 | 0.16 | | 52 | 6.2 | 8.9 | 0.66 |
| Dec | 39 | 6.4 | 11.0 | 0.14 | | 46 | 6.7 | 10.2 | 3.5 |
| | | | | | | | | | |
| Jan94 | 36 | 6.9 | 12.2 | 0.19 | | 46 | 6.7 | 11.2 | 1.1 |
| Feb | 48 | 6.0 | 11.0 | 0.19 | | 47 | 6.3 | 10.8 | 0.66 |

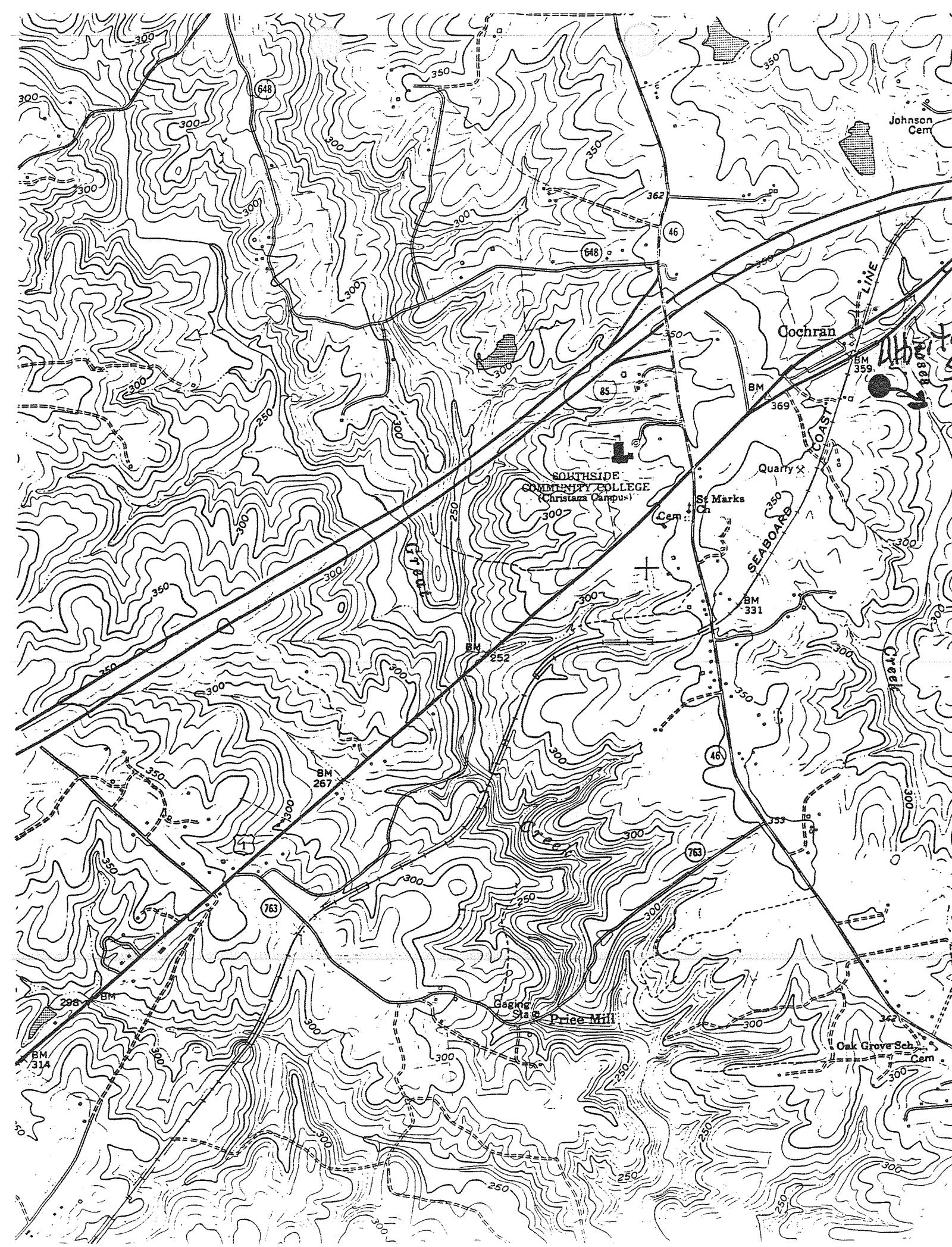
STCRET RETRIEVAL DATE 95/06/29

PGM=RET

5AGTC005.40
 36 44 45.0 077 50 53.0 1
 RT. 713 BRIDGE
 51025 VIRGINIA BRUNSWICK
 03-SOUTHEAST
 5-CHOWAN + DISMAL SW
 21VASWCB 906609 03010204
 0000 FEET DEPTH

/TYP/A/AMOUNT/STREAM

| DATE | TIME | SMK | 00300 | 00299 | 00400 | 31615 | 31616 | 31614 | 00010 | TO | |
|------------|------|--------|---------------|-------|---------------|----------|----------|----------|-------|------|-------|
| FROM OF | | OR | 00 | 00 | PH | FEC COLI | FEC COLI | FEC COLI | WATER | C | |
| TO | DAY | MEDIUM | DEPTH (FT) | MG/L | PROBE MG/L | MPNECMED | MPM-FCBR | MPN | TEMP | | |
| | | | | | SU | /100ML | /100ML | TUBECODE | CENT | | |
| 90/08/13 | 1415 | WATER | 1 | 6.9 | | 7.63 | | 200 | | 2.5 | |
| 90/11/27 | 1330 | WATER | 1 | 10.9 | 10.9 | 6.94 | | | | 9.8 | |
| -91/02/12 | 1240 | WATER | 0.3 | | 12.8 | 7.66 | | 300 | | -5.0 | |
| 91/05/23 | 1247 | WATER | 1 | | 7.5 | 7.18 | | 100K | | 21.4 | |
| 91/08/20 | 1200 | WATER | 0.983999 | | | 5.7 | 6.72 | | 300 | | 24.8 |
| 91/11/25 | 1141 | WATER | 0.983999 | | | 9.4 | 6.64 | | 100U | | 9.9 |
| -92/02/25 | 1110 | WATER | 0.983999 | | | 10.2 | 6.37 | | 200 | | -9.8 |
| 92/05/20 | 1150 | WATER | 0.983999 | | | 7.4 | 6.07 | | 400 | | 17.1 |
| 92/08/20 | 1209 | WATER | 0.983999 | | | 6.3 | 6.17 | | 100 | | 21.8 |
| 92/11/12 | 1145 | WATER | 0.983999 | | | 8.2 | 6.81 | | 100U | | 12.4 |
| -93/02/17 | 1234 | WATER | 0.983999 | | | 11.9 | 6.56 | | 100U | | -6.4 |
| 93/05/17 | 1210 | WATER | 0.983999 | | | 7.1 | 6.36 | | 200 | | 21.1 |
| 93/08/11 | 1140 | WATER | 0.983999 | | | | | | 100U | | |
| 93/11/15 | 1241 | WATER | 0.983999 | | | 7.0 | 6.60 | | 100U | | 15.3 |
| -94/02/16 | 1333 | WATER | 0.983999 | | | 11.4 | 6.42 | | 100 | | -5.7 |
| 94/05/12 | 1145 | WATER | 0.983999 | | | 7.6 | 6.47 | | 100U | | 18.8 |
| 94/07/13 | 1111 | WATER | 0.983999 | | | 5.6 | 6.70 | 330 | | | 25.4 |
| 94/10/19 | 1122 | WATER | 0.983999 | | | 7.8 | 6.65 | 20 | | | 12.8 |
| -95/01/11 | 1212 | WATER | 0.983999 | | | 11.7 | 6.82 | 110 | | | -5.6 |
| -95/04/24 | 1033 | WATER | 0.983999 | | | 7.5 | 6.58 | 16COOL | | | -14.2 |



REGIONAL MODELING SYSTEM VERSION 3.2

MODEL SIMULATION FOR THE ALBERTA STP (VA0026816) DISCHARGE

TO ROSES CREEK -> GREAT CREEK -> MEHERRIN RIVER

COMMENT: ALBERTA AND LAWRENCEVILLE DISCHARGES

THE SIMULATION STARTS AT THE ALBERTA STP (VA0026816) DISCHARGE

***** PROPOSED PERMIT LIMITS *****

FLOW = .1 MGD cBOD5 = 12 Mg/L TKN = 3 Mg/L D.O. = 6.5 Mg/L

*** THE MAXIMUM CHLORINE ALLOWABLE IN THE DISCHARGE IS 0.014 Mg/L ***

THE SECTION BEING MODELED IS BROKEN INTO 4 SEGMENTS
RESULTS WILL BE GIVEN AT 0.1 MILE INTERVALS

***** BACKGROUND CONDITIONS *****

THE 7010 STREAM FLOW AT THE DISCHARGE IS 0.02660 MGD

THE DISSOLVED OXYGEN OF THE STREAM IS 7.722 Mg/L

THE BACKGROUND cBOD5 OF THE STREAM IS 5 Mg/L

THE BACKGROUND nBOD OF THE STREAM IS 0 Mg/L

***** MODEL PARAMETERS *****

| SEG. | LEN. MI | VEL. F/S | K2 1/D | K1 1/D | KN Mg/L | BENTHIC Pt | ELEV. °C | TEMP. DO-SAT Mg/L | |
|------|------------|-------------|-----------|-----------|------------|---------------|-------------|-------------------------|-------|
| 1 | 9.53 | 0.450 | 8.008 | 1.400 | 0.350 | 0.000 | 225.90 | 22.80 | 8.580 |
| 2 | 0.30 | 0.674 | 6.600 | 0.900 | 0.150 | 0.000 | 160.65 | 22.80 | 8.600 |
| 3 | 4.60 | 0.529 | 2.870 | 0.900 | 0.150 | 0.000 | 148.00 | 22.80 | 8.504 |
| 4 | 5.00 | 0.536 | 1.080 | 0.900 | 0.150 | 0.000 | 132.50 | 22.80 | 8.309 |

(The K Rates shown are at 20°C ... the model corrects them for temperature.)

***** RESPONSE FOR SEGMENT 1 *****

TOTAL STREAMFLOW = 0.1266 MGD
 (Including Discharge)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD _u (Mg/L) | nBOD _u (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 0.000 | 6.757 | 24.748 | 0.000 |
| 0.100 | 0.100 | 6.457 | 24.218 | 0.000 |
| 0.200 | 0.200 | 6.201 | 23.700 | 0.000 |
| 0.300 | 0.300 | 5.984 | 23.193 | 0.000 |
| 0.400 | 0.400 | 5.800 | 22.697 | 0.000 |
| 0.500 | 0.500 | 5.647 | 22.211 | 0.000 |
| 0.600 | 0.600 | 5.520 | 21.736 | 0.000 |
| 0.700 | 0.700 | 5.417 | 21.270 | 0.000 |
| 0.800 | 0.800 | 5.335 | 20.815 | 0.000 |
| 0.900 | 0.900 | 5.271 | 20.370 | 0.000 |
| 1.000 | 1.000 | 5.222 | 19.934 | 0.000 |
| 1.100 | 1.100 | 5.188 | 19.507 | 0.000 |
| 1.200 | 1.200 | 5.167 | 19.090 | 0.000 |
| 1.300 | 1.300 | 5.156 | 18.681 | 0.000 |
| 1.400 | 1.400 | 5.155 | 18.281 | 0.000 |
| 1.500 | 1.500 | 5.161 | 17.890 | 0.000 |
| 1.600 | 1.600 | 5.175 | 17.507 | 0.000 |
| 1.700 | 1.700 | 5.195 | 17.132 | 0.000 |
| 1.800 | 1.800 | 5.221 | 16.766 | 0.000 |
| 1.900 | 1.900 | 5.251 | 16.407 | 0.000 |
| 2.000 | 2.000 | 5.285 | 16.056 | 0.000 |
| 2.100 | 2.100 | 5.323 | 15.712 | 0.000 |
| 2.200 | 2.200 | 5.363 | 15.376 | 0.000 |
| 2.300 | 2.300 | 5.405 | 15.047 | 0.000 |
| 2.400 | 2.400 | 5.450 | 14.725 | 0.000 |
| 2.500 | 2.500 | 5.496 | 14.410 | 0.000 |
| 2.600 | 2.600 | 5.544 | 14.101 | 0.000 |
| 2.700 | 2.700 | 5.592 | 13.800 | 0.000 |
| 2.800 | 2.800 | 5.641 | 13.504 | 0.000 |
| 2.900 | 2.900 | 5.691 | 13.215 | 0.000 |
| 3.000 | 3.000 | 5.741 | 12.933 | 0.000 |
| 3.100 | 3.100 | 5.792 | 12.656 | 0.000 |
| 3.200 | 3.200 | 5.842 | 12.385 | 0.000 |
| 3.300 | 3.300 | 5.893 | 12.120 | 0.000 |
| 3.400 | 3.400 | 5.943 | 11.861 | 0.000 |
| 3.500 | 3.500 | 5.993 | 11.607 | 0.000 |
| 3.600 | 3.600 | 6.043 | 11.358 | 0.000 |
| 3.700 | 3.700 | 6.092 | 11.115 | 0.000 |
| 3.800 | 3.800 | 6.140 | 10.877 | 0.000 |
| 3.900 | 3.900 | 6.188 | 10.645 | 0.000 |
| 4.000 | 4.000 | 6.236 | 10.417 | 0.000 |
| 4.100 | 4.100 | 6.283 | 10.194 | 0.000 |
| 4.200 | 4.200 | 6.329 | 9.976 | 0.000 |
| 4.300 | 4.300 | 6.375 | 9.762 | 0.000 |
| 4.400 | 4.400 | 6.420 | 9.553 | 0.000 |
| 4.500 | 4.500 | 6.464 | 9.349 | 0.000 |
| 4.600 | 4.600 | 6.508 | 9.149 | 0.000 |
| 4.700 | 4.700 | 6.550 | 8.953 | 0.000 |
| 4.800 | 4.800 | 6.592 | 8.761 | 0.000 |
| 4.900 | 4.900 | 6.634 | 8.574 | 0.000 |
| 5.000 | 5.000 | 6.674 | 8.390 | 0.000 |
| 5.100 | 5.100 | 6.714 | 8.211 | 0.000 |
| 5.200 | 5.200 | 6.753 | 8.035 | 0.000 |
| 5.300 | 5.300 | 6.791 | 7.863 | 0.000 |

ROSES CREEK SAG

| | | | | |
|-------|-------|-------|-------|-------|
| 5.400 | 5.400 | 6.829 | 7.695 | 0.000 |
| 5.500 | 5.500 | 6.866 | 7.530 | 0.000 |
| 5.600 | 5.600 | 6.902 | 7.369 | 0.000 |
| 5.700 | 5.700 | 6.937 | 7.211 | 0.000 |
| 5.800 | 5.800 | 6.972 | 7.057 | 0.000 |
| 5.900 | 5.900 | 7.006 | 6.906 | 0.000 |
| 6.000 | 6.000 | 7.039 | 6.758 | 0.000 |
| 6.100 | 6.100 | 7.072 | 6.614 | 0.000 |
| 6.200 | 6.200 | 7.104 | 6.472 | 0.000 |
| 6.300 | 6.300 | 7.135 | 6.333 | 0.000 |
| 6.400 | 6.400 | 7.166 | 6.198 | 0.000 |
| 6.500 | 6.500 | 7.196 | 6.065 | 0.000 |
| 6.600 | 6.600 | 7.225 | 5.936 | 0.000 |
| 6.700 | 6.700 | 7.254 | 5.809 | 0.000 |
| 6.800 | 6.800 | 7.282 | 5.684 | 0.000 |
| 6.900 | 6.900 | 7.310 | 5.563 | 0.000 |
| 7.000 | 7.000 | 7.337 | 5.444 | 0.000 |
| 7.100 | 7.100 | 7.364 | 5.327 | 0.000 |
| 7.200 | 7.200 | 7.390 | 5.213 | 0.000 |
| 7.300 | 7.300 | 7.415 | 5.102 | 0.000 |
| 7.400 | 7.400 | 7.440 | 5.000 | 0.000 |
| 7.500 | 7.500 | 7.565 | 5.000 | 0.000 |
| 7.600 | 7.600 | 7.676 | 5.000 | 0.000 |
| 7.700 | 7.700 | 7.722 | 5.000 | 0.000 |
| 7.800 | 7.800 | 7.722 | 5.000 | 0.000 |
| 7.900 | 7.900 | 7.722 | 5.000 | 0.000 |
| 8.000 | 8.000 | 7.722 | 5.000 | 0.000 |
| 8.100 | 8.100 | 7.722 | 5.000 | 0.000 |
| 8.200 | 8.200 | 7.722 | 5.000 | 0.000 |
| 8.300 | 8.300 | 7.722 | 5.000 | 0.000 |
| 8.400 | 8.400 | 7.722 | 5.000 | 0.000 |
| 8.500 | 8.500 | 7.722 | 5.000 | 0.000 |
| 8.600 | 8.600 | 7.722 | 5.000 | 0.000 |
| 8.700 | 8.700 | 7.722 | 5.000 | 0.000 |
| 8.800 | 8.800 | 7.722 | 5.000 | 0.000 |
| 8.900 | 8.900 | 7.722 | 5.000 | 0.000 |
| 9.000 | 9.000 | 7.722 | 5.000 | 0.000 |
| 9.100 | 9.100 | 7.722 | 5.000 | 0.000 |
| 9.200 | 9.200 | 7.722 | 5.000 | 0.000 |
| 9.300 | 9.300 | 7.722 | 5.000 | 0.000 |
| 9.400 | 9.400 | 7.722 | 5.000 | 0.000 |
| 9.500 | 9.500 | 7.722 | 5.000 | 0.000 |
| 9.530 | 9.530 | 7.722 | 5.000 | 0.000 |

FOR THE DISCHARGE AT THE END OF SEGMENT 1

DISCHARGER = LAWRENCEVILLE STP (VA0020354)

FLOW = 1.2 MGD cBOD5 = 10 Mg/L TKN = 3 Mg/L D.O. = 6.5 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 0.2735 MGD

***** RESPONSE FOR SEGMENT 2 *****

TOTAL STREAMFLOW = 1.6001 MGD
(Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD _u (Mg/L) | nBOD _u (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 9.530 | 6.806 | 19.999 | 0.000 |
| 0.100 | 9.630 | 6.738 | 19.814 | 0.000 |
| 0.200 | 9.730 | 6.676 | 19.631 | 0.000 |
| 0.300 | 9.830 | 6.619 | 19.450 | 0.000 |

FOR THE TRIBUTARY AT THE END OF SEGMENT 2
FLOW = .5 MGD cBOD₅ = 2 Mg/L TKN = 0 Mg/L D.O. = 7.74 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 0.0008 MGD

***** RESPONSE FOR SEGMENT 3 *****

TOTAL STREAMFLOW = 2.1009 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD ₅ (Mg/L) | nBOD ₅ (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 9.830 | 6.896 | 16.005 | 0.000 |
| 0.100 | 9.930 | 6.781 | 15.847 | 0.000 |
| 0.200 | 10.030 | 6.580 | 15.690 | 0.000 |
| 0.300 | 10.130 | 6.583 | 15.535 | 0.000 |
| 0.400 | 10.230 | 6.491 | 15.381 | 0.000 |
| 0.500 | 10.330 | 6.403 | 15.229 | 0.000 |
| 0.600 | 10.430 | 6.319 | 15.078 | 0.000 |
| 0.700 | 10.530 | 6.239 | 14.929 | 0.000 |
| 0.800 | 10.630 | 6.163 | 14.781 | 0.000 |
| 0.900 | 10.730 | 6.091 | 14.635 | 0.000 |
| 1.000 | 10.830 | 6.022 | 14.490 | 0.000 |
| 1.100 | 10.930 | 5.956 | 14.347 | 0.000 |
| 1.200 | 11.030 | 5.894 | 14.205 | 0.000 |
| 1.300 | 11.130 | 5.835 | 14.064 | 0.000 |
| 1.400 | 11.230 | 5.779 | 13.925 | 0.000 |
| 1.500 | 11.330 | 5.726 | 13.787 | 0.000 |
| 1.600 | 11.430 | 5.676 | 13.650 | 0.000 |
| 1.700 | 11.530 | 5.629 | 13.515 | 0.000 |
| 1.800 | 11.630 | 5.585 | 13.382 | 0.000 |
| 1.900 | 11.730 | 5.543 | 13.249 | 0.000 |
| 2.000 | 11.830 | 5.504 | 13.118 | 0.000 |
| 2.100 | 11.930 | 5.467 | 12.988 | 0.000 |
| 2.200 | 12.030 | 5.432 | 12.859 | 0.000 |
| 2.300 | 12.130 | 5.400 | 12.732 | 0.000 |
| 2.400 | 12.230 | 5.370 | 12.605 | 0.000 |
| 2.500 | 12.330 | 5.342 | 12.481 | 0.000 |
| 2.600 | 12.430 | 5.316 | 12.358 | 0.000 |
| 2.700 | 12.530 | 5.292 | 12.236 | 0.000 |
| 2.800 | 12.630 | 5.270 | 12.115 | 0.000 |
| 2.900 | 12.730 | 5.250 | 11.995 | 0.000 |
| 3.000 | 12.830 | 5.231 | 11.876 | 0.000 |
| 3.100 | 12.930 | 5.214 | 11.758 | 0.000 |
| 3.200 | 13.030 | 5.199 | 11.642 | 0.000 |
| 3.300 | 13.130 | 5.186 | 11.527 | 0.000 |
| 3.400 | 13.230 | 5.174 | 11.413 | 0.000 |
| 3.500 | 13.330 | 5.163 | 11.300 | 0.000 |
| 3.600 | 13.430 | 5.154 | 11.188 | 0.000 |
| 3.700 | 13.530 | 5.146 | 11.077 | 0.000 |
| 3.800 | 13.630 | 5.140 | 10.968 | 0.000 |
| 3.900 | 13.730 | 5.134 | 10.859 | 0.000 |
| 4.000 | 13.830 | 5.130 | 10.752 | 0.000 |
| 4.100 | 13.930 | 5.128 | 10.645 | 0.000 |
| 4.200 | 14.030 | 5.126 | 10.540 | 0.000 |
| 4.300 | 14.130 | 5.125 | 10.435 | 0.000 |
| 4.400 | 14.230 | 5.126 | 10.332 | 0.000 |
| 4.500 | 14.330 | 5.127 | 10.229 | 0.000 |
| 4.600 | 14.430 | 5.129 | 10.128 | 0.000 |

GREAT CREEK SAG

FOR THE TRIBUTARY AT THE END OF SEGMENT 3
 FLOW = 10.67 MGD cBOD₅ = 2 Mg/L TKN = 0 Mg/L D.O. = 7.7434 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 0.1253 MGD

***** RESPONSE FOR SEGMENT 4 *****

TOTAL STREAMFLOW = 12,8962 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD _u (Mg/L) | nBOD _u (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 14.430 | 7.318 | 5.835 | 0.000 |
| 0.100 | 14.530 | 7.275 | 5.778 | 0.000 |
| 0.200 | 14.630 | 7.233 | 5.722 | 0.000 |
| 0.300 | 14.730 | 7.193 | 5.666 | 0.000 |
| 0.400 | 14.830 | 7.153 | 5.610 | 0.000 |
| 0.500 | 14.930 | 7.115 | 5.555 | 0.000 |
| 0.600 | 15.030 | 7.077 | 5.501 | 0.000 |
| 0.700 | 15.130 | 7.040 | 5.447 | 0.000 |
| 0.800 | 15.230 | 7.005 | 5.394 | 0.000 |
| 0.900 | 15.330 | 6.970 | 5.341 | 0.000 |
| 1.000 | 15.430 | 6.936 | 5.289 | 0.000 |
| 1.100 | 15.530 | 6.903 | 5.237 | 0.000 |
| 1.200 | 15.630 | 6.871 | 5.186 | 0.000 |
| 1.300 | 15.730 | 6.839 | 5.135 | 0.000 |
| 1.400 | 15.830 | 6.809 | 5.084 | 0.000 |
| 1.500 | 15.930 | 6.779 | 5.035 | 0.000 |
| 1.600 | 16.030 | 6.751 | 5.000 | 0.000 |
| 1.700 | 16.130 | 6.771 | 5.000 | 0.000 |
| 1.800 | 16.230 | 6.791 | 5.000 | 0.000 |
| 1.900 | 16.330 | 6.811 | 5.000 | 0.000 |
| 2.000 | 16.430 | 6.831 | 5.000 | 0.000 |
| 2.100 | 16.530 | 6.851 | 5.000 | 0.000 |
| 2.200 | 16.630 | 6.870 | 5.000 | 0.000 |
| 2.300 | 16.730 | 6.889 | 5.000 | 0.000 |
| 2.400 | 16.830 | 6.908 | 5.000 | 0.000 |
| 2.500 | 16.930 | 6.927 | 5.000 | 0.000 |
| 2.600 | 17.030 | 6.946 | 5.000 | 0.000 |
| 2.700 | 17.130 | 6.964 | 5.000 | 0.000 |
| 2.800 | 17.230 | 6.982 | 5.000 | 0.000 |
| 2.900 | 17.330 | 7.000 | 5.000 | 0.000 |
| 3.000 | 17.430 | 7.018 | 5.000 | 0.000 |
| 3.100 | 17.530 | 7.035 | 5.000 | 0.000 |
| 3.200 | 17.630 | 7.053 | 5.000 | 0.000 |
| 3.300 | 17.730 | 7.070 | 5.000 | 0.000 |
| 3.400 | 17.830 | 7.087 | 5.000 | 0.000 |
| 3.500 | 17.930 | 7.104 | 5.000 | 0.000 |
| 3.600 | 18.030 | 7.120 | 5.000 | 0.000 |
| 3.700 | 18.130 | 7.137 | 5.000 | 0.000 |
| 3.800 | 18.230 | 7.153 | 5.000 | 0.000 |
| 3.900 | 18.330 | 7.169 | 5.000 | 0.000 |
| 4.000 | 18.430 | 7.185 | 5.000 | 0.000 |
| 4.100 | 18.530 | 7.201 | 5.000 | 0.000 |
| 4.200 | 18.630 | 7.216 | 5.000 | 0.000 |
| 4.300 | 18.730 | 7.232 | 5.000 | 0.000 |
| 4.400 | 18.830 | 7.247 | 5.000 | 0.000 |
| 4.500 | 18.930 | 7.262 | 5.000 | 0.000 |
| 4.600 | 19.030 | 7.277 | 5.000 | 0.000 |
| 4.700 | 19.130 | 7.291 | 5.000 | 0.000 |

MEHERRIN RIVER SAG

D.O. > 5.576 O.K.

| | | | | |
|-------|--------|-------|-------|-------|
| 4.800 | 19.330 | 7.306 | 5.000 | 0.000 |
| 4.900 | 19.330 | 7.320 | 5.000 | 0.000 |
| 5.000 | 19.430 | 7.334 | 5.000 | 0.000 |

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)
04-10-1996 16:20:42

DATA FILE = ALBERTA.MOD

REGIONAL MODELING SYSTEM

VERSION 3.2

DATA FILE SUMMARY

THE NAME OF THE DATA FILE IS: ALBERTA.MOD

THE STREAM NAME IS: ROSES CREEK -> GREAT CREEK -> MEHERRIN RIVER
THE RIVER BASIN IS: CHOWAN (MEHERRIN)
THE SECTION NUMBER IS: 3
THE CLASSIFICATION IS: III

STANDARDS VIOLATED (Y/N) = N
STANDARDS APPROPRIATE (Y/N) = Y

DISCHARGE WITHIN 3 MILES (Y/N) = N

THE DISCHARGE BEING MODELED IS: ALBERTA STP (VA0026816)

PROPOSED LIMITS ARE:

FLOW = .1 MGD
BOD5 = 12 MG/L
TKN = 3 MG/L
D.O. = 6.5 MG/L

THE NUMBER OF SEGMENTS TO BE MODELED = 4

7Q10 WILL BE CALCULATED BY: DRAINAGE AREA COMPARISON
THE GAUGE NAME IS: VDEQ #02051600 (GREAT CREEK AT RTE. 618 BRIDGE)
GAUGE DRAINAGE AREA = 30.7 SQ.MI.
GAUGE 7Q10 = .336 MGD
DRAINAGE AREA AT DISCHARGE = 2.43 SQ.MI.

STREAM A DRY DITCH AT DISCHARGE (Y/N) = N
ANTIDEGRADATION APPLIES (Y/N) = N

ALLOCATION DESIGN TEMPERATURE = 22.8 °C

SEGMENT INFORMATION

SEGMENT # 1

SEGMENT ENDS BECAUSE: A DISCHARGE ENTERS AT END

SEGMENT LENGTH = 9.53 MI

SEGMENT WIDTH = 1 FT

SEGMENT DEPTH = .17 FT

SEGMENT VELOCITY = .63 FT/SEC

DRAINAGE AREA AT SEGMENT START = 2.43 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 27.42 SQ.MI.

ELEVATION AT UPSTREAM END = 289.5 FT

ELEVATION AT DOWNSTREAM END = 162.3 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

THE DISCHARGE AT THE SEGMENT END IS: LAWRENCEVILLE STP (VA0020354)

ITS CONCENTRATIONS ARE:

FLOW = 1.2 MGD

BOD5 = 10 MG/L

TKN = 3 MG/L

D.O. = 6.5 MG/L

SEGMENT INFORMATION

SEGMENT # 2

SEGMENT ENDS BECAUSE: A TRIBUTARY ENTERS AT END

SEGMENT LENGTH = .3 MI

SEGMENT WIDTH = 5 FT

SEGMENT DEPTH = .6 FT

SEGMENT VELOCITY = .75 FT/SEC

DRAINAGE AREA AT SEGMENT START = 27.42 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 27.49 SQ.MI.

ELEVATION AT UPSTREAM END = 162.3 FT

ELEVATION AT DOWNSTREAM END = 159 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

TRIBUTARY DATA

FLOW = .5 MGD

BOD5 = 2 MG/L

TKN = 0 MG/L

D.O. = 7.5085 MG/L

SEGMENT INFORMATION

SEGMENT # 3

SEGMENT ENDS BECAUSE: A TRIBUTARY ENTERS AT END

SEGMENT LENGTH = 4.6 MI

SEGMENT WIDTH = 5 FT

SEGMENT DEPTH = .8 FT

SEGMENT VELOCITY = .8 FT/SEC

DRAINAGE AREA AT SEGMENT START = 45.74 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 57.19 SQ.MI.

ELEVATION AT UPSTREAM END = 159 FT

ELEVATION AT DOWNSTREAM END = 137 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

TRIBUTARY DATA

FLOW = 10.67 MGD

BOD5 = 2 MG/L

TKN = 0 MG/L

D.O. = 7.5118 MG/L

SEGMENT INFORMATION

SEGMENT # 4

SEGMENT ENDS BECAUSE: THE MODEL ENDS

SEGMENT LENGTH = 5 MI

SEGMENT WIDTH = 20 FT

SEGMENT DEPTH = 2 FT

SEGMENT VELOCITY = .5 FT/SEC

DRAINAGE AREA AT SEGMENT START = 653.3 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 740.15 SQ.MI.

ELEVATION AT UPSTREAM END = 137 FT

ELEVATION AT DOWNSTREAM END = 128 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MOSTLY STRAIGHT

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)

04-10-1996 16:25:20

REGIONAL MODELING SYSTEM VERSION 3.2

MODEL SIMULATION FOR THE ALBERTA STP DISCHARGE

TO ROSES CREEK

COMMENT: BASELINE MODEL

THE SIMULATION STARTS AT THE ALBERTA STP DISCHARGE

***** PROPOSED PERMIT LIMITS *****

FLOW = .1 MGD cBOD5 = 25 Mg/L TKN = 20 Mg/L D.O. = 5 Mg/L

*** THE MAXIMUM CHLORINE ALLOWABLE IN THE DISCHARGE IS 0.014 Mg/L ***

THE SECTION BEING MODELED IS BROKEN INTO 4 SEGMENTS
RESULTS WILL BE GIVEN AT 0.1 MILE INTERVALS

***** BACKGROUND CONDITIONS *****

THE 7Q10 STREAM FLOW AT THE DISCHARGE IS 0.02660 MGD

THE DISSOLVED OXYGEN OF THE STREAM IS 7.722 Mg/L

THE BACKGROUND cBOD6 OF THE STREAM IS 5 Mg/L

THE BACKGROUND nBOD OF THE STREAM IS 0 Mg/L

***** MODEL PARAMETERS *****

| SEG. | LEN. Mi | VEL. F/S | K2 1/D | K1 1/D | KN 1/D | BENTHIC Mg/L | ELEV. Ft | TEMP. °C | DO-SAT Mg/L |
|------|------------|-------------|-----------|-----------|-----------|-----------------|-------------|-------------|----------------|
| 1 | 9.53 | 0.450 | 8.008 | 1.600 | 0.550 | 0.000 | 225.80 | 22.80 | 8.580 |
| 2 | 0.30 | 0.674 | 6.600 | 1.100 | 0.350 | 0.000 | 160.65 | 22.80 | 8.520 |
| 3 | 4.60 | 0.629 | 2.870 | 1.100 | 0.350 | 0.000 | 148.20 | 22.80 | 8.524 |
| 4 | 5.00 | 0.636 | 1.080 | 1.100 | 0.350 | 0.000 | 132.50 | 22.80 | 8.524 |

(The K Rates shown are at 20°C ... the model corrects them for temperature.)

***** RESPONSE FOR SEGMENT 1 *****

TOTAL STREAMFLOW = 0.1266 MGD
 (Including Discharge)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD _u (Mg/L) | nBOD _u (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 0.000 | 5.572 | 50.420 | 58.146 |
| 0.100 | 0.100 | 4.234 | 49.389 | 57.609 |
| 0.200 | 0.200 | 3.075 | 47.988 | 57.078 |
| 0.300 | 0.300 | 2.076 | 46.816 | 56.551 |
| 0.400 | 0.400 | 1.219 | 45.673 | 56.029 |
| 0.500 | 0.500 | 0.486 | 44.557 | 55.512 |
| 0.600 | 0.600 | 0.000 | 43.469 | 55.000 |
| 0.700 | 0.700 | 0.000 | 42.408 | 54.493 |
| 0.800 | 0.800 | 0.000 | 41.372 | 53.990 |
| 0.900 | 0.900 | 0.000 | 40.362 | 53.492 |
| 1.000 | 1.000 | 0.000 | 39.376 | 52.998 |
| 1.100 | 1.100 | 0.000 | 38.415 | 52.509 |
| 1.200 | 1.200 | 0.000 | 37.476 | 52.025 |
| 1.300 | 1.300 | 0.000 | 36.561 | 51.544 |
| 1.400 | 1.400 | 0.000 | 35.668 | 51.069 |
| 1.500 | 1.500 | 0.000 | 34.797 | 50.598 |
| 1.600 | 1.600 | 0.000 | 33.948 | 50.131 |
| 1.700 | 1.700 | 0.000 | 33.119 | 49.668 |
| 1.800 | 1.800 | 0.000 | 32.310 | 49.210 |
| 1.900 | 1.900 | 0.000 | 31.521 | 48.756 |
| 2.000 | 2.000 | 0.000 | 30.751 | 48.306 |
| 2.100 | 2.100 | 0.000 | 30.000 | 47.860 |
| 2.200 | 2.200 | 0.000 | 29.267 | 47.419 |
| 2.300 | 2.300 | 0.000 | 28.553 | 46.981 |
| 2.400 | 2.400 | 0.000 | 27.855 | 46.548 |
| 2.500 | 2.500 | 0.000 | 27.175 | 46.118 |
| 2.600 | 2.600 | 0.000 | 26.512 | 45.693 |
| 2.700 | 2.700 | 0.000 | 25.864 | 45.271 |
| 2.800 | 2.800 | 0.000 | 25.233 | 44.853 |
| 2.900 | 2.900 | 0.000 | 24.616 | 44.439 |
| 3.000 | 3.000 | 0.000 | 24.015 | 44.029 |
| 3.100 | 3.100 | 0.005 | 23.429 | 43.623 |
| 3.200 | 3.200 | 0.026 | 22.857 | 43.220 |
| 3.300 | 3.300 | 0.062 | 22.299 | 42.822 |
| 3.400 | 3.400 | 0.110 | 21.754 | 42.426 |
| 3.500 | 3.500 | 0.169 | 21.223 | 42.035 |
| 3.600 | 3.600 | 0.237 | 20.705 | 41.647 |
| 3.700 | 3.700 | 0.313 | 20.199 | 41.263 |
| 3.800 | 3.800 | 0.396 | 19.706 | 40.882 |
| 3.900 | 3.900 | 0.484 | 19.224 | 40.505 |
| 4.000 | 4.000 | 0.577 | 18.755 | 40.131 |
| 4.100 | 4.100 | 0.674 | 18.297 | 39.761 |
| 4.200 | 4.200 | 0.774 | 17.850 | 39.394 |
| 4.300 | 4.300 | 0.876 | 17.414 | 39.030 |
| 4.400 | 4.400 | 0.980 | 16.989 | 38.670 |
| 4.500 | 4.500 | 1.086 | 16.574 | 38.313 |
| 4.600 | 4.600 | 1.193 | 16.169 | 37.960 |
| 4.700 | 4.700 | 1.301 | 15.774 | 37.610 |
| 4.800 | 4.800 | 1.409 | 15.389 | 37.263 |
| 4.900 | 4.900 | 1.517 | 15.013 | 36.919 |
| 5.000 | 5.000 | 1.625 | 14.647 | 36.578 |
| 5.100 | 5.100 | 1.732 | 14.289 | 36.241 |
| 5.200 | 5.200 | 1.839 | 13.940 | 35.906 |
| 5.300 | 5.300 | 1.945 | 13.600 | 35.575 |

| | | | | |
|-------|-------|-------|--------|--------|
| 5.400 | 5.400 | 2.050 | 13.268 | 35.247 |
| 5.500 | 5.500 | 2.154 | 12.944 | 34.921 |
| 5.600 | 5.600 | 2.267 | 12.528 | 34.599 |
| 5.700 | 5.700 | 2.359 | 12.319 | 34.280 |
| 5.800 | 5.800 | 2.459 | 12.018 | 33.964 |
| 5.900 | 5.900 | 2.558 | 11.725 | 33.650 |
| 6.000 | 6.000 | 2.656 | 11.439 | 33.340 |
| 6.100 | 6.100 | 2.752 | 11.159 | 33.032 |
| 6.200 | 6.200 | 2.847 | 10.887 | 32.727 |
| 6.300 | 6.300 | 2.941 | 10.621 | 32.425 |
| 6.400 | 6.400 | 3.033 | 10.361 | 32.126 |
| 6.500 | 6.500 | 3.123 | 10.108 | 31.830 |
| 6.600 | 6.600 | 3.212 | 9.862 | 31.536 |
| 6.700 | 6.700 | 3.299 | 9.621 | 31.245 |
| 6.800 | 6.800 | 3.385 | 9.386 | 30.957 |
| 6.900 | 6.900 | 3.469 | 9.157 | 30.671 |
| 7.000 | 7.000 | 3.552 | 8.933 | 30.388 |
| 7.100 | 7.100 | 3.634 | 8.715 | 30.108 |
| 7.200 | 7.200 | 3.714 | 8.502 | 29.830 |
| 7.300 | 7.300 | 3.792 | 8.295 | 29.555 |
| 7.400 | 7.400 | 3.869 | 8.092 | 29.282 |
| 7.500 | 7.500 | 3.945 | 7.894 | 29.012 |
| 7.600 | 7.600 | 4.019 | 7.701 | 28.744 |
| 7.700 | 7.700 | 4.092 | 7.513 | 28.479 |
| 7.800 | 7.800 | 4.163 | 7.330 | 28.216 |
| 7.900 | 7.900 | 4.234 | 7.151 | 27.955 |
| 8.000 | 8.000 | 4.302 | 6.976 | 27.698 |
| 8.100 | 8.100 | 4.370 | 6.806 | 27.442 |
| 8.200 | 8.200 | 4.436 | 6.640 | 27.189 |
| 8.300 | 8.300 | 4.501 | 6.473 | 26.938 |
| 8.400 | 8.400 | 4.565 | 6.319 | 26.689 |
| 8.500 | 8.500 | 4.628 | 6.165 | 26.443 |
| 8.600 | 8.600 | 4.689 | 6.015 | 26.199 |
| 8.700 | 8.700 | 4.750 | 5.868 | 25.957 |
| 8.800 | 8.800 | 4.809 | 5.724 | 25.718 |
| 8.900 | 8.900 | 4.867 | 5.584 | 25.480 |
| 9.000 | 9.000 | 4.924 | 5.448 | 25.245 |
| 9.100 | 9.100 | 4.980 | 5.315 | 25.012 |
| 9.200 | 9.200 | 5.035 | 5.185 | 24.782 |
| 9.300 | 9.300 | 5.089 | 5.059 | 24.553 |
| 9.400 | 9.400 | 5.141 | 5.000 | 24.326 |
| 9.500 | 9.500 | 5.307 | 5.000 | 24.092 |
| 9.530 | 9.530 | 5.353 | 5.000 | 24.035 |

THE STANDARDS ARE VIOLATED IN THIS SEGMENT

FOR THE DISCHARGE AT THE END OF SEGMENT 1

DISCHARGER = LAWRENCEVILLE STP

FLOW = .6 MGD cBOD5 = 25 Mg/L TKN = 20 Mg/L D.O. = 6.5 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 0.2735 MGD

***** RESPONSE FOR SEGMENT 2 *****

TOTAL STREAMFLOW = 1.0001 MGD
(Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD ₅ (Mg/L) | nBOD ₅ (Mg/L) |
|-------------------------------------|---|-------------------------|--------------------------|--------------------------|
| 0.000 | 9.530 | 6.689 | 39.496 | 47.204 |
| 0.100 | 9.630 | 6.196 | 39.051 | 47.018 |
| 0.200 | 9.730 | 5.739 | 38.610 | 46.833 |
| 0.300 | 9.830 | 5.316 | 38.174 | 46.649 |

FOR THE TRIBUTARY AT THE END OF SEGMENT 2
FLOW = .5 MGD cBOD₅ = 2 Mg/L TKN = 0 Mg/L D.O. = 7.74 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 0.0008 MGD

***** RESPONSE FOR SEGMENT 3 *****

TOTAL STREAMFLOW = 1.5009 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD ₅ (Mg/L) | nBOD ₅ (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 9.830 | 6.125 | 27.106 | 31.085 |
| 0.100 | 9.930 | 5.746 | 26.778 | 30.954 |
| 0.200 | 10.030 | 5.383 | 26.455 | 30.824 |
| 0.300 | 10.130 | 5.035 | 26.135 | 30.694 |
| 0.400 | 10.230 | 4.701 | 25.819 | 30.565 |
| 0.500 | 10.330 | 4.381 | 25.507 | 30.436 |
| 0.600 | 10.430 | 4.076 | 25.199 | 30.308 |
| 0.700 | 10.530 | 3.783 | 24.894 | 30.180 |
| 0.800 | 10.630 | 3.503 | 24.594 | 30.053 |
| 0.900 | 10.730 | 3.235 | 24.296 | 29.927 |
| 1.000 | 10.830 | 2.979 | 24.003 | 29.801 |
| 1.100 | 10.930 | 2.735 | 23.713 | 29.675 |
| 1.200 | 11.030 | 2.502 | 23.426 | 29.550 |
| 1.300 | 11.130 | 2.279 | 23.143 | 29.426 |
| 1.400 | 11.230 | 2.068 | 22.863 | 29.302 |
| 1.500 | 11.330 | 1.865 | 22.587 | 29.178 |
| 1.600 | 11.430 | 1.671 | 22.314 | 29.055 |
| 1.700 | 11.530 | 1.491 | 22.044 | 28.933 |
| 1.800 | 11.630 | 1.317 | 21.778 | 28.811 |
| 1.900 | 11.730 | 1.153 | 21.515 | 28.690 |
| 2.000 | 11.830 | 0.998 | 21.255 | 28.569 |
| 2.100 | 11.930 | 0.848 | 20.996 | 28.449 |
| 2.200 | 12.030 | 0.708 | 20.744 | 28.329 |
| 2.300 | 12.130 | 0.575 | 20.493 | 28.209 |
| 2.400 | 12.230 | 0.459 | 20.246 | 28.089 |
| 2.500 | 12.330 | 0.332 | 20.001 | 27.969 |
| 2.600 | 12.430 | 0.220 | 19.759 | 27.849 |
| 2.700 | 12.530 | 0.116 | 19.521 | 27.729 |
| 2.800 | 12.630 | 0.018 | 19.285 | 27.609 |
| 2.900 | 12.730 | 0.000 | 19.052 | 27.489 |
| 3.000 | 12.830 | 0.000 | 18.822 | 27.369 |
| 3.100 | 12.930 | 0.000 | 18.594 | 27.249 |
| 3.200 | 13.030 | 0.000 | 18.366 | 27.129 |
| 3.300 | 13.130 | 0.000 | 18.147 | 27.009 |
| 3.400 | 13.230 | 0.000 | 17.928 | 26.889 |
| 3.500 | 13.330 | 0.000 | 17.710 | 26.769 |
| 3.600 | 13.430 | 0.000 | 17.497 | 26.649 |
| 3.700 | 13.530 | 0.000 | 17.286 | 26.529 |
| 3.800 | 13.630 | 0.000 | 17.077 | 26.409 |
| 3.900 | 13.730 | 0.000 | 16.871 | 26.289 |
| 4.000 | 13.830 | 0.000 | 16.667 | 26.169 |
| 4.100 | 13.930 | 0.000 | 16.463 | 26.049 |
| 4.200 | 14.030 | 0.000 | 16.260 | 25.929 |
| 4.300 | 14.130 | 0.000 | 16.057 | 25.809 |
| 4.400 | 14.230 | 0.000 | 15.854 | 25.689 |
| 4.500 | 14.330 | 0.000 | 15.651 | 25.569 |
| 4.600 | 14.430 | 0.000 | 15.448 | 25.449 |

THE STANDARDS ARE VIOLATED IN THIS SEGMENT

FOR THE TRIBUTARY AT THE END OF SEGMENT 3
 FLOW = 10.67 MGD cBOD₅ = 2 Mg/L TKN = 0 Mg/L D.O. = 7.7434 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 0.1253 MGD

***** RESPONSE FOR SEGMENT 4 *****

TOTAL STREAMFLOW = 12,2962 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD _U (Mg/L) | nBOD _U (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 14.430 | 6.798 | 6.281 | 3.125 |
| 0.100 | 14.530 | 6.731 | 6.206 | 3.112 |
| 0.200 | 14.630 | 6.665 | 6.132 | 3.099 |
| 0.300 | 14.730 | 6.600 | 6.058 | 3.086 |
| 0.400 | 14.830 | 6.538 | 5.986 | 3.073 |
| 0.500 | 14.930 | 6.477 | 5.914 | 3.060 |
| 0.600 | 15.030 | 6.417 | 5.844 | 3.047 |
| 0.700 | 15.130 | 6.359 | 5.774 | 3.035 |
| 0.800 | 15.230 | 6.303 | 5.705 | 3.022 |
| 0.900 | 15.330 | 6.248 | 5.636 | 3.010 |
| 1.000 | 15.430 | 6.195 | 5.569 | 2.997 |
| 1.100 | 15.530 | 6.143 | 5.503 | 2.985 |
| 1.200 | 15.630 | 6.092 | 5.437 | 2.972 |
| 1.300 | 15.730 | 6.043 | 5.372 | 2.960 |
| 1.400 | 15.830 | 5.995 | 5.307 | 2.947 |
| 1.500 | 15.930 | 5.949 | 5.244 | 2.935 |
| 1.600 | 16.030 | 5.904 | 5.181 | 2.923 |
| 1.700 | 16.130 | 5.860 | 5.120 | 2.911 |
| 1.800 | 16.230 | 5.817 | 5.058 | 2.899 |
| 1.900 | 16.330 | 5.776 | 5.000 | 2.887 |
| 2.000 | 16.430 | 5.795 | 5.000 | 2.875 |
| 2.100 | 16.530 | 5.814 | 5.000 | 2.863 |
| 2.200 | 16.630 | 5.833 | 5.000 | 2.851 |
| 2.300 | 16.730 | 5.852 | 5.000 | 2.839 |
| 2.400 | 16.830 | 5.871 | 5.000 | 2.827 |
| 2.500 | 16.930 | 5.889 | 5.000 | 2.815 |
| 2.600 | 17.030 | 5.907 | 5.000 | 2.803 |
| 2.700 | 17.130 | 5.926 | 5.000 | 2.792 |
| 2.800 | 17.230 | 5.944 | 5.000 | 2.780 |
| 2.900 | 17.330 | 5.962 | 5.000 | 2.769 |
| 3.000 | 17.430 | 5.979 | 5.000 | 2.757 |
| 3.100 | 17.530 | 5.997 | 5.000 | 2.746 |
| 3.200 | 17.630 | 6.014 | 5.000 | 2.734 |
| 3.300 | 17.730 | 6.031 | 5.000 | 2.723 |
| 3.400 | 17.830 | 6.049 | 5.000 | 2.711 |
| 3.500 | 17.930 | 6.066 | 5.000 | 2.700 |
| 3.600 | 18.030 | 6.083 | 5.000 | 2.689 |
| 3.700 | 18.130 | 6.099 | 5.000 | 2.678 |
| 3.800 | 18.230 | 6.116 | 5.000 | 2.667 |
| 3.900 | 18.330 | 6.132 | 5.000 | 2.655 |
| 4.000 | 18.430 | 6.149 | 5.000 | 2.644 |
| 4.100 | 18.530 | 6.165 | 5.000 | 2.633 |
| 4.200 | 18.630 | 6.181 | 5.000 | 2.622 |
| 4.300 | 18.730 | 6.197 | 5.000 | 2.612 |
| 4.400 | 18.830 | 6.213 | 5.000 | 2.601 |
| 4.500 | 18.930 | 6.228 | 5.000 | 2.590 |
| 4.600 | 19.030 | 6.244 | 5.000 | 2.579 |
| 4.700 | 19.130 | 6.259 | 5.000 | 2.568 |

BASELINE SAG

ALLOWABLE DO IN MEHERRIN
 WITHOUT VIOLATING ANTIDEGRADATION
DO = 5.576

| | | | | |
|-------|--------|-------|-------|-------|
| 4.800 | 19.230 | 6.275 | 5.000 | 2.558 |
| 4.900 | 19.330 | 6.290 | 5.000 | 2.547 |
| 5.000 | 19.430 | 6.305 | 5.000 | 2.536 |

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)
04-10-1996 16:28:16

DATA FILE = ALBRTBAS.MOD

REGIONAL MODELING SYSTEM

VERSION 3.2

DATA FILE SUMMARY

THE NAME OF THE DATA FILE IS: ALBRTBAS.MOD

THE STREAM NAME IS: ROSES CREEK
THE RIVER BASIN IS: CHOWAN (MEHERRIN)
THE SECTION NUMBER IS: 3
THE CLASSIFICATION IS: III.

STANDARDS VIOLATED (Y/N) = N
STANDARDS APPROPRIATE (Y/N) = Y

DISCHARGE WITHIN 3 MILES (Y/N) = N

THE DISCHARGE BEING MODELED IS: ALBERTA STP

PROPOSED LIMITS ARE:

FLOW = .1 MGD
BOD5 = 25 MG/L
TKN = 20 MG/L
D.O. = 5 MG/L

THE NUMBER OF SEGMENTS TO BE MODELED = 4

7Q10 WILL BE CALCULATED BY: DRAINAGE AREA COMPARISON

THE GAUGE NAME IS: VDEQ #02051600
GAUGE DRAINAGE AREA = 30.7 SQ.MI.
GAUGE 7Q10 = .336 MGD
DRAINAGE AREA AT DISCHARGE = 2.43 SQ.MI.

STREAM A DRY DITCH AT DISCHARGE (Y/N) = N
ANTIDEGRADATION APPLIES (Y/N) = N

ALLOCATION DESIGN TEMPERATURE = 22.8 °C

SEGMENT INFORMATION

SEGMENT # 1

SEGMENT ENDS BECAUSE: A DISCHARGE ENTERS AT END

SEGMENT LENGTH = 9.53 MI

SEGMENT WIDTH = 1 FT

SEGMENT DEPTH = .17 FT

SEGMENT VELOCITY = .63 FT/SEC

DRAINAGE AREA AT SEGMENT START = 2.42 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 27.42 SQ.MI.

ELEVATION AT UPSTREAM END = 289.5 FT

ELEVATION AT DOWNSTREAM END = 162.3 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

THE DISCHARGE AT THE SEGMENT END IS: LAWRENCEVILLE STP

ITS CONCENTRATIONS ARE:

FLOW = .5 MGD

BOD5 = 25 MG/L

TKN = 20 MG/L

D.O. = 6.5 MG/L

SEGMENT INFORMATION

SEGMENT # 2

SEGMENT ENDS BECAUSE: A TRIBUTARY ENTERS AT END

SEGMENT LENGTH = .3 MI

SEGMENT WIDTH = 5 FT

SEGMENT DEPTH = .5 FT

SEGMENT VELOCITY = .75 FT/SEC

DRAINAGE AREA AT SEGMENT START = 27.42 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 27.49 SQ.MI.

ELEVATION AT UPSTREAM END = 162.3 FT

ELEVATION AT DOWNSTREAM END = 159 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

TRIBUTARY DATA

FLOW = .5 MGD

BOD5 = 2 MG/L

TKN = 0 MG/L

D.O. = 7.5085 MG/L

SEGMENT INFORMATION

SEGMENT # 3

SEGMENT ENDS BECAUSE: A TRIBUTARY ENTERS AT END

SEGMENT LENGTH = 4.6 MI

SEGMENT WIDTH = 5 FT

SEGMENT DEPTH = .8 FT

SEGMENT VELOCITY = .8 FT/SEC

DRAINAGE AREA AT SEGMENT START = 45.74 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 57.19 SQ.MI.

ELEVATION AT UPSTREAM END = 159 FT

ELEVATION AT DOWNSTREAM END = 137 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

TRIBUTARY DATA

FLOW = 10.67 MGD

BOD5 = 2 MG/L

TKN = 0 MG/L

D.O. = 7.5118 MG/L

SEGMENT INFORMATION

***** SEGMENT # 4 *****

SEGMENT ENDS BECAUSE: THE MODEL ENDS

SEGMENT LENGTH = 5 MI

SEGMENT WIDTH = 20 FT

SEGMENT DEPTH = 2 FT

SEGMENT VELOCITY = .5 FT/SEC

DRAINAGE AREA AT SEGMENT START = 653.3 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 740.15 SQ.MI.

ELEVATION AT UPSTREAM END = 137 FT

ELEVATION AT DOWNSTREAM END = 128 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MOSTLY STRAIGHT

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)

04-10-1996 16:32:43

JAN - APRIL

REGIONAL MODELING SYSTEM VERSION 3.2

MODEL SIMULATION FOR THE ALBERTA STP (VA0026816) DISCHARGE

TO ROSES CREEK-> GREAT CREEK-> MEHERRIN RIVER

COMMENT: HIGH FLOW RELIEF CONDITIONS (JAN - APRIL)

THE SIMULATION STARTS AT THE ALBERTA STP (VA0026816) DISCHARGE

***** PROPOSED PERMIT LIMITS *****

FLOW = .1 MGD cBOD5 = 25 Mg/L TKN = 20 Mg/L D.O. = 5 Mg/L

**** THE MAXIMUM CHLORINE ALLOWABLE IN THE DISCHARGE IS 0.055 Mg/L ****

THE SECTION BEING MODELED IS BROKEN INTO 4 SEGMENTS
RESULTS WILL BE GIVEN AT 0.1 MILE INTERVALS

***** BACKGROUND CONDITIONS *****

THE 7Q10 STREAM FLOW AT THE DISCHARGE IS 0.39893 MGD

THE DISSOLVED OXYGEN OF THE STREAM IS 9.517 Mg/L

THE BACKGROUND cBOD5 OF THE STREAM IS 5 Mg/L

THE BACKGROUND nBOD OF THE STREAM IS 0 Mg/L

***** MODEL PARAMETERS *****

| SEG. | LEN. Mi | VEL. F/S | K2 1/D | K1 1/D | KN 1/D | BENTHIC Mg/L | ELEV. Ft | TEMP. °C | DO-SAT Mg/L |
|------|------------|-------------|-----------|-----------|-----------|-----------------|-------------|-------------|----------------|
| 1 | 9.53 | 0.701 | 8.008 | 1.700 | 0.650 | 0.000 | 225.90 | 12.40 | 10.575 |
| 2 | 0.30 | 0.802 | 6.600 | 0.700 | 0.250 | 0.000 | 160.65 | 12.49 | 10.599 |
| 3 | 4.60 | 0.849 | 2.870 | 1.200 | 0.450 | 0.900 | 148.00 | 12.49 | 10.604 |
| 4 | 5.00 | 1.226 | 1.080 | 1.200 | 0.450 | 0.300 | 132.50 | 12.40 | 10.569 |

(The K Rates shown are at 20°C ... the model corrects them for temperature.)

***** RESPONSE FOR SEGMENT 1 *****

TOTAL STREAMFLOW = 0.4989 MGD
 (Including Discharge)

| SEGMENT FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD ₅ (Mg/L) | nBOD ₅ (Mg/L) |
|--|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 0.000 | 8.612 | 16.525 | 14.753 |
| 0.100 | 0.100 | 8.511 | 16.353 | 14.707 |
| 0.200 | 0.200 | 8.417 | 16.183 | 14.661 |
| 0.300 | 0.300 | 8.321 | 16.014 | 14.614 |
| 0.400 | 0.400 | 8.222 | 15.848 | 14.558 |
| 0.500 | 0.500 | 8.128 | 15.683 | 14.522 |
| 0.600 | 0.600 | 8.111 | 15.520 | 14.477 |
| 0.700 | 0.700 | 8.050 | 15.358 | 14.431 |
| 0.800 | 0.800 | 7.993 | 15.199 | 14.385 |
| 0.900 | 0.900 | 7.942 | 15.040 | 14.340 |
| 1.000 | 1.000 | 7.895 | 14.884 | 14.295 |
| 1.100 | 1.100 | 7.853 | 14.729 | 14.250 |
| 1.200 | 1.200 | 7.814 | 14.576 | 14.205 |
| 1.300 | 1.300 | 7.780 | 14.424 | 14.160 |
| 1.400 | 1.400 | 7.749 | 14.274 | 14.116 |
| 1.500 | 1.500 | 7.722 | 14.126 | 14.071 |
| 1.600 | 1.600 | 7.698 | 13.979 | 14.027 |
| 1.700 | 1.700 | 7.676 | 13.834 | 13.982 |
| 1.800 | 1.800 | 7.658 | 13.690 | 13.938 |
| 1.900 | 1.900 | 7.642 | 13.547 | 13.894 |
| 2.000 | 2.000 | 7.629 | 13.406 | 13.851 |
| 2.100 | 2.100 | 7.618 | 13.267 | 13.807 |
| 2.200 | 2.200 | 7.609 | 13.129 | 13.763 |
| 2.300 | 2.300 | 7.602 | 12.992 | 13.720 |
| 2.400 | 2.400 | 7.597 | 12.857 | 13.677 |
| 2.500 | 2.500 | 7.594 | 12.724 | 13.634 |
| 2.600 | 2.600 | 7.593 | 12.591 | 13.591 |
| 2.700 | 2.700 | 7.593 | 12.460 | 13.548 |
| 2.800 | 2.800 | 7.594 | 12.331 | 13.505 |
| 2.900 | 2.900 | 7.597 | 12.202 | 13.462 |
| 3.000 | 3.000 | 7.601 | 12.075 | 13.420 |
| 3.100 | 3.100 | 7.607 | 11.950 | 13.378 |
| 3.200 | 3.200 | 7.613 | 11.825 | 13.335 |
| 3.300 | 3.300 | 7.621 | 11.703 | 13.293 |
| 3.400 | 3.400 | 7.629 | 11.581 | 13.252 |
| 3.500 | 3.500 | 7.638 | 11.460 | 13.210 |
| 3.600 | 3.600 | 7.648 | 11.341 | 13.168 |
| 3.700 | 3.700 | 7.659 | 11.223 | 13.127 |
| 3.800 | 3.800 | 7.671 | 11.106 | 13.085 |
| 3.900 | 3.900 | 7.683 | 10.991 | 13.044 |
| 4.000 | 4.000 | 7.696 | 10.877 | 13.003 |
| 4.100 | 4.100 | 7.709 | 10.764 | 12.962 |
| 4.200 | 4.200 | 7.723 | 10.651 | 12.921 |
| 4.300 | 4.300 | 7.737 | 10.541 | 12.880 |
| 4.400 | 4.400 | 7.752 | 10.431 | 12.840 |
| 4.500 | 4.500 | 7.767 | 10.323 | 12.799 |
| 4.600 | 4.600 | 7.783 | 10.215 | 12.759 |
| 4.700 | 4.700 | 7.799 | 10.109 | 12.719 |
| 4.800 | 4.800 | 7.815 | 10.004 | 12.678 |
| 4.900 | 4.900 | 7.831 | 9.900 | 12.638 |
| 5.000 | 5.000 | 7.848 | 9.797 | 12.599 |
| 5.100 | 5.100 | 7.865 | 9.695 | 12.559 |
| 5.200 | 5.200 | 7.882 | 9.594 | 12.519 |
| 5.300 | 5.300 | 7.899 | 9.494 | 12.480 |

ROSES CREEK SAG

| | | | | |
|-------|-------|-------|-------|--------|
| 5.400 | 5.400 | 7.910 | 9.395 | 12.440 |
| 5.500 | 5.500 | 7.814 | 9.298 | 12.401 |
| 5.600 | 5.600 | 7.852 | 9.301 | 12.362 |
| 5.700 | 5.700 | 7.970 | 9.105 | 12.323 |
| 5.800 | 5.800 | 7.937 | 9.012 | 12.284 |
| 5.900 | 5.900 | 8.005 | 8.917 | 12.245 |
| 6.000 | 6.000 | 8.023 | 8.824 | 12.206 |
| 6.100 | 6.100 | 8.041 | 8.732 | 12.168 |
| 6.200 | 6.200 | 8.059 | 8.641 | 12.130 |
| 6.300 | 6.300 | 8.077 | 8.550 | 12.092 |
| 6.400 | 6.400 | 8.095 | 8.462 | 12.054 |
| 6.500 | 6.500 | 8.113 | 8.375 | 12.015 |
| 6.600 | 6.600 | 8.131 | 8.287 | 11.978 |
| 6.700 | 6.700 | 8.149 | 8.201 | 11.940 |
| 6.800 | 6.800 | 8.167 | 8.116 | 11.902 |
| 6.900 | 6.900 | 8.185 | 8.031 | 11.865 |
| 7.000 | 7.000 | 8.203 | 7.948 | 11.828 |
| 7.100 | 7.100 | 8.221 | 7.865 | 11.790 |
| 7.200 | 7.200 | 8.238 | 7.784 | 11.753 |
| 7.300 | 7.300 | 8.256 | 7.702 | 11.715 |
| 7.400 | 7.400 | 8.274 | 7.622 | 11.679 |
| 7.500 | 7.500 | 8.291 | 7.543 | 11.642 |
| 7.600 | 7.600 | 8.309 | 7.465 | 11.606 |
| 7.700 | 7.700 | 8.326 | 7.387 | 11.569 |
| 7.800 | 7.800 | 8.344 | 7.310 | 11.532 |
| 7.900 | 7.900 | 8.361 | 7.234 | 11.496 |
| 8.000 | 8.000 | 8.378 | 7.159 | 11.460 |
| 8.100 | 8.100 | 8.395 | 7.084 | 11.424 |
| 8.200 | 8.200 | 8.412 | 7.011 | 11.388 |
| 8.300 | 8.300 | 8.429 | 6.938 | 11.352 |
| 8.400 | 8.400 | 8.445 | 6.866 | 11.316 |
| 8.500 | 8.500 | 8.462 | 6.794 | 11.280 |
| 8.600 | 8.600 | 8.478 | 6.724 | 11.245 |
| 8.700 | 8.700 | 8.495 | 6.654 | 11.209 |
| 8.800 | 8.800 | 8.511 | 6.584 | 11.174 |
| 8.900 | 8.900 | 8.527 | 6.516 | 11.139 |
| 9.000 | 9.000 | 8.543 | 6.448 | 11.104 |
| 9.100 | 9.100 | 8.559 | 6.381 | 11.069 |
| 9.200 | 9.200 | 8.575 | 6.315 | 11.034 |
| 9.300 | 9.300 | 8.590 | 6.249 | 10.999 |
| 9.400 | 9.400 | 8.606 | 6.184 | 10.964 |
| 9.500 | 9.500 | 8.622 | 6.120 | 10.930 |
| 9.530 | 9.530 | 8.626 | 6.101 | 10.919 |

FOR THE DISCHARGE AT THE END OF SEGMENT 1

DISCHARGER = LAWRENCEVILLE STP (VA0020354)

FLOW = 1.2 MGD cBOD5 = 20 Mg/L TKN = 20 Mg/L D.O. = 5 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 4.1026 MGD

***** RESPONSE FOR SEGMENT 2 *****

TOTAL STREAMFLOW = 5.8015 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD ₅ (Mg/L) | nBOD ₅ (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 9.530 | 8.506 | 14.403 | 16.165 |
| 0.100 | 9.630 | 8.522 | 14.348 | 16.147 |
| 0.200 | 9.730 | 8.538 | 14.295 | 16.130 |
| 0.300 | 9.830 | 8.554 | 14.241 | 16.113 |

FOR THE TRIBUTARY AT THE END OF SEGMENT 2
 FLOW = 7.51 MGD cBOD₅ = 2 Mg/L TKN = 0 Mg/L D.O. = 9.539 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 0.0115 MGD

***** RESPONSE FOR SEGMENT 3 *****

TOTAL STREAMFLOW = 13.3230 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | CBOD ₅ (Mg/L) | DBOD ₅ (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 9.830 | 9.110 | 9.024 | 7.017 |
| 0.100 | 9.930 | 9.069 | 8.959 | 7.004 |
| 0.200 | 10.030 | 9.028 | 8.915 | 6.991 |
| 0.300 | 10.130 | 8.989 | 8.860 | 6.979 |
| 0.400 | 10.230 | 8.951 | 8.807 | 6.966 |
| 0.500 | 10.330 | 8.914 | 8.753 | 6.953 |
| 0.600 | 10.430 | 8.877 | 8.700 | 6.941 |
| 0.700 | 10.530 | 8.842 | 8.647 | 6.929 |
| 0.800 | 10.630 | 8.808 | 8.594 | 6.916 |
| 0.900 | 10.730 | 8.774 | 8.542 | 6.904 |
| 1.000 | 10.830 | 8.742 | 8.490 | 6.891 |
| 1.100 | 10.930 | 8.710 | 8.439 | 6.879 |
| 1.200 | 11.030 | 8.679 | 8.387 | 6.866 |
| 1.300 | 11.130 | 8.650 | 8.337 | 6.854 |
| 1.400 | 11.230 | 8.620 | 8.286 | 6.841 |
| 1.500 | 11.330 | 8.592 | 8.235 | 6.829 |
| 1.600 | 11.430 | 8.565 | 8.185 | 6.817 |
| 1.700 | 11.530 | 8.538 | 8.136 | 6.805 |
| 1.800 | 11.630 | 8.512 | 8.086 | 6.792 |
| 1.900 | 11.730 | 8.487 | 8.037 | 6.780 |
| 2.000 | 11.830 | 8.463 | 7.988 | 6.768 |
| 2.100 | 11.930 | 8.439 | 7.940 | 6.755 |
| 2.200 | 12.030 | 8.417 | 7.892 | 6.743 |
| 2.300 | 12.130 | 8.394 | 7.844 | 6.731 |
| 2.400 | 12.230 | 8.373 | 7.796 | 6.719 |
| 2.500 | 12.330 | 8.352 | 7.749 | 6.707 |
| 2.600 | 12.430 | 8.332 | 7.701 | 6.695 |
| 2.700 | 12.530 | 8.312 | 7.653 | 6.683 |
| 2.800 | 12.630 | 8.293 | 7.608 | 6.671 |
| 2.900 | 12.730 | 8.275 | 7.562 | 6.659 |
| 3.000 | 12.830 | 8.258 | 7.516 | 6.647 |
| 3.100 | 12.930 | 8.241 | 7.470 | 6.635 |
| 3.200 | 13.030 | 8.224 | 7.425 | 6.623 |
| 3.300 | 13.130 | 8.208 | 7.380 | 6.611 |
| 3.400 | 13.230 | 8.193 | 7.335 | 6.599 |
| 3.500 | 13.330 | 8.178 | 7.290 | 6.587 |
| 3.600 | 13.430 | 8.164 | 7.245 | 6.575 |
| 3.700 | 13.530 | 8.150 | 7.202 | 6.563 |
| 3.800 | 13.630 | 8.137 | 7.158 | 6.551 |
| 3.900 | 13.730 | 8.125 | 7.115 | 6.540 |
| 4.000 | 13.830 | 8.112 | 7.072 | 6.528 |
| 4.100 | 13.930 | 8.101 | 7.029 | 6.516 |
| 4.200 | 14.030 | 8.090 | 6.986 | 6.504 |
| 4.300 | 14.130 | 8.079 | 6.943 | 6.492 |
| 4.400 | 14.230 | 8.069 | 6.901 | 6.481 |
| 4.500 | 14.330 | 8.059 | 6.859 | 6.469 |
| 4.600 | 14.430 | 8.049 | 6.818 | 6.457 |

GREAT CREEK SAG

FOR THE TRIBUTARY AT THE END OF SEGMENT 3
 FLOW = 78.6 MGD CBOD₅ = 2 Mg/L TKN = 0 Mg/L D.O. = 9.5432 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 1.8797 MGD

***** RESPONSE FOR SEGMENT 4 *****

TOTAL STREAMFLOW = 93.8027 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD _u (Mg/L) | nBOD _u (Mg/L) |
|---|---|-------------------------------|-----------------------------|-----------------------------|
| 0.000 | 14.430 | 9.331 | 5.258 | 0.917 |
| 0.100 | 14.530 | 9.314 | 5.236 | 0.916 |
| 0.200 | 14.630 | 9.296 | 5.214 | 0.915 |
| 0.300 | 14.730 | 9.279 | 5.192 | 0.914 |
| 0.400 | 14.830 | 9.262 | 5.170 | 0.913 |
| 0.500 | 14.930 | 9.245 | 5.148 | 0.912 |
| 0.600 | 15.030 | 9.229 | 5.127 | 0.910 |
| 0.700 | 15.130 | 9.212 | 5.105 | 0.909 |
| 0.800 | 15.230 | 9.196 | 5.084 | 0.908 |
| 0.900 | 15.330 | 9.180 | 5.062 | 0.907 |
| 1.000 | 15.430 | 9.164 | 5.041 | 0.906 |
| 1.100 | 15.530 | 9.148 | 5.020 | 0.905 |
| 1.200 | 15.630 | 9.132 | 5.000 | 0.904 |
| 1.300 | 15.730 | 9.138 | 5.000 | 0.903 |
| 1.400 | 15.830 | 9.143 | 5.000 | 0.902 |
| 1.500 | 15.930 | 9.149 | 5.000 | 0.901 |
| 1.600 | 16.030 | 9.154 | 5.000 | 0.900 |
| 1.700 | 16.130 | 9.160 | 5.000 | 0.898 |
| 1.800 | 16.230 | 9.165 | 5.000 | 0.897 |
| 1.900 | 16.330 | 9.170 | 5.000 | 0.896 |
| 2.000 | 16.430 | 9.176 | 5.000 | 0.895 |
| 2.100 | 16.530 | 9.181 | 5.000 | 0.894 |
| 2.200 | 16.630 | 9.186 | 5.000 | 0.893 |
| 2.300 | 16.730 | 9.191 | 5.000 | 0.892 |
| 2.400 | 16.830 | 9.197 | 5.000 | 0.891 |
| 2.500 | 16.930 | 9.202 | 5.000 | 0.890 |
| 2.600 | 17.030 | 9.207 | 5.000 | 0.888 |
| 2.700 | 17.130 | 9.212 | 5.000 | 0.887 |
| 2.800 | 17.230 | 9.217 | 5.000 | 0.886 |
| 2.900 | 17.330 | 9.223 | 5.000 | 0.885 |
| 3.000 | 17.430 | 9.228 | 5.000 | 0.884 |
| 3.100 | 17.530 | 9.233 | 5.000 | 0.883 |
| 3.200 | 17.630 | 9.238 | 5.000 | 0.882 |
| 3.300 | 17.730 | 9.243 | 5.000 | 0.881 |
| 3.400 | 17.830 | 9.248 | 5.000 | 0.880 |
| 3.500 | 17.930 | 9.253 | 5.000 | 0.879 |
| 3.600 | 18.030 | 9.258 | 5.000 | 0.877 |
| 3.700 | 18.130 | 9.263 | 5.000 | 0.876 |
| 3.800 | 18.230 | 9.268 | 5.000 | 0.875 |
| 3.900 | 18.330 | 9.273 | 5.000 | 0.874 |
| 4.000 | 18.430 | 9.278 | 5.000 | 0.873 |
| 4.100 | 18.530 | 9.283 | 5.000 | 0.872 |
| 4.200 | 18.630 | 9.288 | 5.000 | 0.871 |
| 4.300 | 18.730 | 9.292 | 5.000 | 0.870 |
| 4.400 | 18.830 | 9.297 | 5.000 | 0.869 |
| 4.500 | 18.930 | 9.302 | 5.000 | 0.868 |
| 4.600 | 19.030 | 9.307 | 5.000 | 0.867 |
| 4.700 | 19.130 | 9.311 | 5.000 | 0.865 |

MEHERRIN RIVER SAG

DO > 9.111 → O.K.

| | | | | |
|-------|--------|-------|-------|-------|
| 4.800 | 19.230 | 9.316 | 5.000 | 0.864 |
| 4.900 | 19.230 | 9.321 | 5.000 | 0.863 |
| 5.000 | 19.230 | 9.326 | 5.000 | 0.862 |

REGIONAL MODELING SYSTEM Ver 3.2 (OWBM - 9/90)
04-11-1996 07:48:16

DATA FILE = ALBEEHIGH.MOD

REGIONAL MODELING SYSTEM VERSION 3.2DATA FILE SUMMARY

THE NAME OF THE DATA FILE IS: ALBRHIGH.MOD

THE STREAM NAME IS: ROSES CREEK-> GREAT CREEK-> MEHERRIN RIVER
THE RIVER BASIN IS: CHOWAN
THE SECTION NUMBER IS: 3
THE CLASSIFICATION IS: IIISTANDARDS VIOLATED (Y/N) = N
STANDARDS APPROPRIATE (Y/N) = Y

DISCHARGE WITHIN 3 MILES (Y/N) = N

THE DISCHARGE BEING MODELED IS: ALBERTA STP (VA0026816)

PROPOSED LIMITS ARE:

FLOW = .1 MGD
BOD5 = 25 MG/L
TKN = 20 MG/L
D.O. = 5 MG/L

THE NUMBER OF SEGMENTS TO BE MODELED = 4

7Q10 WILL BE CALCULATED BY: DRAINAGE AREA COMPARISON

THE GAUGE NAME IS: VDEQ #02015600
GAUGE DRAINAGE AREA = 30.7 SQ.MI.
GAUGE 7Q10 = 5.04 MGD
DRAINAGE AREA AT DISCHARGE = 2.43 SQ.MI.STREAM A DRY DITCH AT DISCHARGE (Y/N) = N
ANTIDEGRADATION APPLIES (Y/N) = N

ALLOCATION DESIGN TEMPERATURE = 12.4 °C

SEGMENT INFORMATION

||||||| SEGMENT # 1 |||||

SEGMENT ENDS BECAUSE: A DISCHARGE ENTERS AT END

SEGMENT LENGTH = 9.53 MI

SEGMENT WIDTH = 2 FT

SEGMENT DEPTH = .3 FT

SEGMENT VELOCITY = 1 FT/SEC

DRAINAGE AREA AT SEGMENT START = 2.43 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 27.42 SQ.MI.

ELEVATION AT UPSTREAM END = 289.5 FT

ELEVATION AT DOWNSTREAM END = 162.3 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIPPLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

THE DISCHARGE AT THE SEGMENT END IS: LAWRENCEVILLE STP (VA0020354)

ITS CONCENTRATIONS ARE:

FLOW = 1.2 MGD

BOD5 = 20 MG/L

TKN = 20 MG/L

D.O. = 5 MG/L

SEGMENT INFORMATION

SEGMENT # 2

SEGMENT ENDS BECAUSE: A TRIBUTARY ENTERS AT END

SEGMENT LENGTH = .3 MI

SEGMENT WIDTH = 9.5 FT

SEGMENT DEPTH = 1 FT

SEGMENT VELOCITY = .75 FT/SEC

DRAINAGE AREA AT SEGMENT START = 27.42 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 27.49 SQ.MI.

ELEVATION AT UPSTREAM END = 162.3 FT

ELEVATION AT DOWNSTREAM END = 159 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

TRIBUTARY DATA

FLOW = 7.51 MGD

BOD5 = 2 MG/L

TKN = 0 MG/L

D.O. = 9.539 MG/L

SEGMENT INFORMATION

||||| SEGMENT # 3 |||||

SEGMENT ENDS BECAUSE: A TRIBUTARY ENTERS AT END

SEGMENT LENGTH = 4.6 MI

SEGMENT WIDTH = 9.5 FT

SEGMENT DEPTH = 1.5 FT

SEGMENT VELOCITY = 1 FT/SEC

DRAINAGE AREA AT SEGMENT START = 45.74 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 57.19 SQ.MI.

ELEVATION AT UPSTREAM END = 159 FT

ELEVATION AT DOWNSTREAM END = 137 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

TRIBUTARY DATA

FLOW = 78.6 MGD

BOD5 = 2 MG/L

TKN = 0 MG/L

D.O. = 9.5432 MG/L

SEGMENT INFORMATION

***** SEGMENT # 4 *****

SEGMENT ENDS BECAUSE: THE MODEL ENDS

SEGMENT LENGTH = 5 MI

SEGMENT WIDTH = 30 FT

SEGMENT DEPTH = 2.7 FT

SEGMENT VELOCITY = 1.5 FT/SEC

DRAINAGE AREA AT SEGMENT START = 653.3 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 740.15 SQ.MI.

ELEVATION AT UPSTREAM END = 137 FT

ELEVATION AT DOWNSTREAM END = 128 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MOSTLY STRAIGHT

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)
04-11-1996 07:52:56

HIGH FLOW BASELINE

REGIONAL MODELING SYSTEM VERSION 3.2

MODEL SIMULATION FOR THE ALBERTA STP (VA0026816) DISCHARGE

TO ROSES CREEK-> GREAT CREEK-> MEHERRIN RIVER

COMMENT: HIGH FLOW/LOW TEMP BASELINE CONDITIONS

THE SIMULATION STARTS AT THE ALBERTA STP (VA0026816) DISCHARGE

PROPOSED PERMIT LIMITS

FLOW = .1 MGD cBOD5 = 25 Mg/L TKN = 20 Mg/L D.O. = 5 Mg/L

***** THE MAXIMUM CHLORINE ALLOWABLE IN THE DISCHARGE IS 0.055 Mg/L *****

THE SECTION BEING MODELED IS BROKEN INTO 4 SEGMENTS
RESULTS WILL BE GIVEN AT 0.1 MILE INTERVALS

BACKGROUND CONDITIONS

THE 7Q10 STREAM FLOW AT THE DISCHARGE IS 0.39893 MGD

THE DISSOLVED OXYGEN OF THE STREAM IS 9.517 Mg/L

THE BACKGROUND cBOD5 OF THE STREAM IS 5 Mg/L

THE BACKGROUND nBOD OF THE STREAM IS 0 Mg/L

MODEL PARAMETERS

| SEG. | LEN. Mi | VEL. F/S | K2 1/D | K1 1/D | KN Mg/L | BENTHIC | ELEV. Ft | TEMP. °C | DO-SAT Mg/L |
|------|------------|-------------|-----------|-----------|------------|---------|-------------|-------------|----------------|
| 1 | 9.53 | 0.701 | 8.008 | 1.700 | 0.650 | 0.000 | 225.90 | 12.40 | 10.575 |
| 2 | 0.30 | 0.802 | 6.600 | 0.700 | 0.250 | 0.000 | 160.55 | 12.40 | 10.599 |
| 3 | 4.50 | 0.849 | 2.870 | 1.200 | 0.450 | 0.000 | 148.00 | 12.40 | 10.604 |
| 4 | 5.00 | 1.226 | 1.080 | 1.200 | 0.450 | 0.000 | 132.50 | 12.40 | 10.609 |

(The K Rates shown are at 20°C ... the model corrects them for temperature.)

***** RESPONSE FOR SEGMENT 1 *****

TOTAL STREAMFLOW = 0.4989 MGD
 (Including Discharge)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD _u (Mg/L) | nBOD _u (Mg/L) |
|-------------------------------------|---|-------------------------|--------------------------|--------------------------|
| 0.000 | 0.000 | 8.612 | 16.525 | 14.753 |
| 0.100 | 0.100 | 8.511 | 16.353 | 14.707 |
| 0.200 | 0.200 | 8.417 | 16.183 | 14.661 |
| 0.300 | 0.300 | 8.331 | 16.014 | 14.614 |
| 0.400 | 0.400 | 8.252 | 15.848 | 14.568 |
| 0.500 | 0.500 | 8.178 | 15.683 | 14.522 |
| 0.600 | 0.600 | 8.111 | 15.520 | 14.477 |
| 0.700 | 0.700 | 8.050 | 15.358 | 14.431 |
| 0.800 | 0.800 | 7.993 | 15.199 | 14.385 |
| 0.900 | 0.900 | 7.942 | 15.040 | 14.340 |
| 1.000 | 1.000 | 7.895 | 14.884 | 14.295 |
| 1.100 | 1.100 | 7.853 | 14.729 | 14.250 |
| 1.200 | 1.200 | 7.814 | 14.576 | 14.205 |
| 1.300 | 1.300 | 7.780 | 14.424 | 14.160 |
| 1.400 | 1.400 | 7.749 | 14.274 | 14.116 |
| 1.500 | 1.500 | 7.722 | 14.126 | 14.071 |
| 1.600 | 1.600 | 7.698 | 13.979 | 14.027 |
| 1.700 | 1.700 | 7.676 | 13.834 | 13.982 |
| 1.800 | 1.800 | 7.658 | 13.690 | 13.938 |
| 1.900 | 1.900 | 7.642 | 13.547 | 13.894 |
| 2.000 | 2.000 | 7.629 | 13.406 | 13.851 |
| 2.100 | 2.100 | 7.618 | 13.267 | 13.807 |
| 2.200 | 2.200 | 7.609 | 13.129 | 13.763 |
| 2.300 | 2.300 | 7.602 | 12.992 | 13.720 |
| 2.400 | 2.400 | 7.597 | 12.857 | 13.677 |
| 2.500 | 2.500 | 7.594 | 12.724 | 13.634 |
| 2.600 | 2.600 | 7.593 | 12.591 | 13.591 |
| 2.700 | 2.700 | 7.593 | 12.460 | 13.548 |
| 2.800 | 2.800 | 7.594 | 12.331 | 13.505 |
| 2.900 | 2.900 | 7.597 | 12.202 | 13.462 |
| 3.000 | 3.000 | 7.601 | 12.075 | 13.420 |
| 3.100 | 3.100 | 7.607 | 11.950 | 13.378 |
| 3.200 | 3.200 | 7.613 | 11.825 | 13.335 |
| 3.300 | 3.300 | 7.621 | 11.703 | 13.293 |
| 3.400 | 3.400 | 7.629 | 11.581 | 13.252 |
| 3.500 | 3.500 | 7.638 | 11.460 | 13.210 |
| 3.600 | 3.600 | 7.648 | 11.341 | 13.168 |
| 3.700 | 3.700 | 7.659 | 11.223 | 13.127 |
| 3.800 | 3.800 | 7.671 | 11.106 | 13.085 |
| 3.900 | 3.900 | 7.683 | 10.991 | 13.044 |
| 4.000 | 4.000 | 7.696 | 10.877 | 13.003 |
| 4.100 | 4.100 | 7.709 | 10.764 | 12.962 |
| 4.200 | 4.200 | 7.723 | 10.651 | 12.921 |
| 4.300 | 4.300 | 7.737 | 10.541 | 12.880 |
| 4.400 | 4.400 | 7.752 | 10.431 | 12.840 |
| 4.500 | 4.500 | 7.767 | 10.323 | 12.799 |
| 4.600 | 4.600 | 7.783 | 10.215 | 12.759 |
| 4.700 | 4.700 | 7.799 | 10.109 | 12.719 |
| 4.800 | 4.800 | 7.815 | 10.004 | 12.678 |
| 4.900 | 4.900 | 7.831 | 9.900 | 12.638 |
| 5.000 | 5.000 | 7.848 | 9.797 | 12.599 |
| 5.100 | 5.100 | 7.865 | 9.695 | 12.559 |
| 5.200 | 5.200 | 7.882 | 9.594 | 12.519 |
| 5.300 | 5.300 | 7.899 | 9.494 | 12.480 |

| | | | | |
|-------|-------|-------|-------|--------|
| 5.400 | 5.400 | 7.917 | 9.395 | 12.440 |
| 5.500 | 5.500 | 7.934 | 9.298 | 12.401 |
| 5.600 | 5.600 | 7.952 | 9.201 | 12.362 |
| 5.700 | 5.700 | 7.970 | 9.105 | 12.323 |
| 5.800 | 5.800 | 7.987 | 9.010 | 12.284 |
| 5.900 | 5.900 | 8.005 | 8.917 | 12.245 |
| 6.000 | 6.000 | 8.023 | 8.824 | 12.207 |
| 6.100 | 6.100 | 8.041 | 8.732 | 12.168 |
| 6.200 | 6.200 | 8.059 | 8.641 | 12.130 |
| 6.300 | 6.300 | 8.077 | 8.552 | 12.092 |
| 6.400 | 6.400 | 8.095 | 8.462 | 12.054 |
| 6.500 | 6.500 | 8.113 | 8.375 | 12.016 |
| 6.600 | 6.600 | 8.131 | 8.287 | 11.978 |
| 6.700 | 6.700 | 8.149 | 8.201 | 11.940 |
| 6.800 | 6.800 | 8.167 | 8.116 | 11.902 |
| 6.900 | 6.900 | 8.185 | 8.031 | 11.865 |
| 7.000 | 7.000 | 8.203 | 7.948 | 11.828 |
| 7.100 | 7.100 | 8.221 | 7.865 | 11.790 |
| 7.200 | 7.200 | 8.238 | 7.784 | 11.753 |
| 7.300 | 7.300 | 8.256 | 7.702 | 11.716 |
| 7.400 | 7.400 | 8.274 | 7.622 | 11.679 |
| 7.500 | 7.500 | 8.291 | 7.543 | 11.642 |
| 7.600 | 7.600 | 8.309 | 7.465 | 11.606 |
| 7.700 | 7.700 | 8.326 | 7.387 | 11.569 |
| 7.800 | 7.800 | 8.344 | 7.310 | 11.532 |
| 7.900 | 7.900 | 8.361 | 7.234 | 11.496 |
| 8.000 | 8.000 | 8.378 | 7.159 | 11.460 |
| 8.100 | 8.100 | 8.395 | 7.084 | 11.424 |
| 8.200 | 8.200 | 8.412 | 7.011 | 11.388 |
| 8.300 | 8.300 | 8.429 | 6.938 | 11.352 |
| 8.400 | 8.400 | 8.445 | 6.866 | 11.316 |
| 8.500 | 8.500 | 8.462 | 6.794 | 11.280 |
| 8.600 | 8.600 | 8.478 | 6.724 | 11.245 |
| 8.700 | 8.700 | 8.495 | 6.654 | 11.209 |
| 8.800 | 8.800 | 8.511 | 6.584 | 11.174 |
| 8.900 | 8.900 | 8.527 | 6.516 | 11.139 |
| 9.000 | 9.000 | 8.543 | 6.448 | 11.104 |
| 9.100 | 9.100 | 8.559 | 6.381 | 11.069 |
| 9.200 | 9.200 | 8.575 | 6.315 | 11.034 |
| 9.300 | 9.300 | 8.590 | 6.249 | 10.999 |
| 9.400 | 9.400 | 8.606 | 6.184 | 10.964 |
| 9.500 | 9.500 | 8.622 | 6.120 | 10.930 |
| 9.530 | 9.530 | 8.626 | 6.101 | 10.919 |

FOR THE DISCHARGE AT THE END OF SEGMENT 1

DISCHARGER = LAWRENCEVILLE STP (VA0020354)

FLOW = .6 MGD cBOD5 = 25 Mg/L TKN = 20 Mg/L D.O. = 6.5 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 4.1026 MGD

***** RESPONSE FOR SEGMENT 2 *****

TOTAL STREAMFLOW = 5.2015 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM MODEL BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD ₅ (Mg/L) | nBOD ₅ (Mg/L) |
|-------------------------------------|---|-------------------------|--------------------------|--------------------------|
| 0.000 | 9.530 | 9.084 | 11.738 | 9.538 |
| 0.100 | 9.630 | 9.093 | 11.694 | 9.528 |
| 0.200 | 9.730 | 9.102 | 11.650 | 9.518 |
| 0.300 | 9.830 | 9.111 | 11.606 | 9.508 |

FOR THE TRIBUTARY AT THE END OF SEGMENT 2
 FLOW = 7.51 MGD cBOD₅ = 2 Mg/L TKN = 0 Mg/L D.O. = 9.539 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 0.0115 MGD

***** RESPONSE FOR SEGMENT 3 *****

TOTAL STREAMFLOW = 12.7230 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD ₅ (Mg/L) | nBOD ₅ (Mg/L) |
|-------------------------------------|-------------------------------------|-------------------------|--------------------------|--------------------------|
| 0.000 | 9.830 | 9.364 | 7.701 | 3.887 |
| 0.100 | 9.930 | 9.332 | 7.654 | 3.880 |
| 0.200 | 10.030 | 9.300 | 7.608 | 3.873 |
| 0.300 | 10.130 | 9.270 | 7.561 | 3.866 |
| 0.400 | 10.230 | 9.240 | 7.516 | 3.859 |
| 0.500 | 10.330 | 9.211 | 7.470 | 3.852 |
| 0.600 | 10.430 | 9.183 | 7.424 | 3.845 |
| 0.700 | 10.530 | 9.156 | 7.379 | 3.838 |
| 0.800 | 10.630 | 9.129 | 7.334 | 3.832 |
| 0.900 | 10.730 | 9.104 | 7.290 | 3.825 |
| 1.000 | 10.830 | 9.078 | 7.246 | 3.818 |
| 1.100 | 10.930 | 9.054 | 7.202 | 3.811 |
| 1.200 | 11.030 | 9.030 | 7.158 | 3.804 |
| 1.300 | 11.130 | 9.007 | 7.114 | 3.797 |
| 1.400 | 11.230 | 8.985 | 7.071 | 3.790 |
| 1.500 | 11.330 | 8.963 | 7.028 | 3.783 |
| 1.600 | 11.430 | 8.942 | 6.985 | 3.777 |
| 1.700 | 11.530 | 8.922 | 6.943 | 3.770 |
| 1.800 | 11.630 | 8.902 | 6.901 | 3.763 |
| 1.900 | 11.730 | 8.883 | 6.859 | 3.756 |
| 2.000 | 11.830 | 8.864 | 6.817 | 3.749 |
| 2.100 | 11.930 | 8.846 | 6.776 | 3.743 |
| 2.200 | 12.030 | 8.829 | 6.735 | 3.736 |
| 2.300 | 12.130 | 8.812 | 6.694 | 3.729 |
| 2.400 | 12.230 | 8.795 | 6.653 | 3.722 |
| 2.500 | 12.330 | 8.780 | 6.613 | 3.716 |
| 2.600 | 12.430 | 8.765 | 6.572 | 3.709 |
| 2.700 | 12.530 | 8.750 | 6.532 | 3.702 |
| 2.800 | 12.630 | 8.735 | 6.493 | 3.696 |
| 2.900 | 12.730 | 8.722 | 6.453 | 3.689 |
| 3.000 | 12.830 | 8.708 | 6.414 | 3.682 |
| 3.100 | 12.930 | 8.696 | 6.375 | 3.676 |
| 3.200 | 13.030 | 8.683 | 6.336 | 3.669 |
| 3.300 | 13.130 | 8.671 | 6.298 | 3.662 |
| 3.400 | 13.230 | 8.660 | 6.260 | 3.656 |
| 3.500 | 13.330 | 8.649 | 6.222 | 3.649 |
| 3.600 | 13.430 | 8.638 | 6.184 | 3.643 |
| 3.700 | 13.530 | 8.628 | 6.146 | 3.636 |
| 3.800 | 13.630 | 8.619 | 6.109 | 3.629 |
| 3.900 | 13.730 | 8.609 | 6.072 | 3.623 |
| 4.000 | 13.830 | 8.600 | 6.035 | 3.616 |
| 4.100 | 13.930 | 8.592 | 5.998 | 3.610 |
| 4.200 | 14.030 | 8.584 | 5.962 | 3.603 |
| 4.300 | 14.130 | 8.576 | 5.926 | 3.597 |
| 4.400 | 14.230 | 8.568 | 5.890 | 3.590 |
| 4.500 | 14.330 | 8.561 | 5.854 | 3.584 |
| 4.600 | 14.430 | 8.555 | 5.818 | 3.577 |

FOR THE TRIBUTARY AT THE END OF SEGMENT 3
 FLOW = .78.6 MGD cBOD₅ = 2 Mg/L TKN = 0 Mg/L D.O. = 9.5432 Mg/L

FLOW FROM INCREMENTAL DRAINAGE AREA = 1.8797 MGD

***** RESPONSE FOR SEGMENT 4 *****

TOTAL STREAMFLOW = 93.2028 MGD
 (Including Discharge, Tributaries and Incremental D.A. Flow)

| DISTANCE FROM HEAD OF SEGMENT (MI.) | TOTAL DISTANCE FROM BEGINNING (MI.) | DISSOLVED OXYGEN (Mg/L) | cBOD _u (Mg/L) | nBOD _u (Mg/L) |
|-------------------------------------|-------------------------------------|-------------------------|--------------------------|--------------------------|
| 0.000 | 14.430 | 9.408 | 5.112 | 0.488 |
| 0.100 | 14.530 | 9.392 | 5.090 | 0.488 |
| 0.200 | 14.630 | 9.375 | 5.069 | 0.487 |
| 0.300 | 14.730 | 9.359 | 5.048 | 0.486 |
| 0.400 | 14.830 | 9.342 | 5.026 | 0.486 |
| 0.500 | 14.930 | 9.326 | 5.005 | 0.485 |
| 0.600 | 15.030 | 9.311 | 5.000 | 0.485 |
| 0.700 | 15.130 | 9.316 | 5.000 | 0.484 |
| 0.800 | 15.230 | 9.321 | 5.000 | 0.484 |
| 0.900 | 15.330 | 9.326 | 5.000 | 0.483 |
| 1.000 | 15.430 | 9.331 | 5.000 | 0.482 |
| 1.100 | 15.530 | 9.336 | 5.000 | 0.482 |
| 1.200 | 15.630 | 9.342 | 5.000 | 0.481 |
| 1.300 | 15.730 | 9.347 | 5.000 | 0.481 |
| 1.400 | 15.830 | 9.352 | 5.000 | 0.480 |
| 1.500 | 15.930 | 9.357 | 5.000 | 0.479 |
| 1.600 | 16.030 | 9.362 | 5.000 | 0.479 |
| 1.700 | 16.130 | 9.367 | 5.000 | 0.478 |
| 1.800 | 16.230 | 9.372 | 5.000 | 0.477 |
| 1.900 | 16.330 | 9.377 | 5.000 | 0.477 |
| 2.000 | 16.430 | 9.382 | 5.000 | 0.476 |
| 2.100 | 16.530 | 9.387 | 5.000 | 0.476 |
| 2.200 | 16.630 | 9.391 | 5.000 | 0.475 |
| 2.300 | 16.730 | 9.396 | 5.000 | 0.475 |
| 2.400 | 16.830 | 9.401 | 5.000 | 0.474 |
| 2.500 | 16.930 | 9.406 | 5.000 | 0.473 |
| 2.600 | 17.030 | 9.411 | 5.000 | 0.473 |
| 2.700 | 17.130 | 9.415 | 5.000 | 0.472 |
| 2.800 | 17.230 | 9.420 | 5.000 | 0.472 |
| 2.900 | 17.330 | 9.425 | 5.000 | 0.471 |
| 3.000 | 17.430 | 9.430 | 5.000 | 0.470 |
| 3.100 | 17.530 | 9.434 | 5.000 | 0.470 |
| 3.200 | 17.630 | 9.439 | 5.000 | 0.469 |
| 3.300 | 17.730 | 9.444 | 5.000 | 0.468 |
| 3.400 | 17.830 | 9.448 | 5.000 | 0.468 |
| 3.500 | 17.930 | 9.453 | 5.000 | 0.467 |
| 3.600 | 18.030 | 9.458 | 5.000 | 0.467 |
| 3.700 | 18.130 | 9.462 | 5.000 | 0.466 |
| 3.800 | 18.230 | 9.467 | 5.000 | 0.465 |
| 3.900 | 18.330 | 9.471 | 5.000 | 0.465 |
| 4.000 | 18.430 | 9.476 | 5.000 | 0.464 |
| 4.100 | 18.530 | 9.480 | 5.000 | 0.464 |
| 4.200 | 18.630 | 9.485 | 5.000 | 0.463 |
| 4.300 | 18.730 | 9.489 | 5.000 | 0.462 |
| 4.400 | 18.830 | 9.494 | 5.000 | 0.461 |
| 4.500 | 18.930 | 9.498 | 5.000 | 0.461 |
| 4.600 | 19.030 | 9.502 | 5.000 | 0.461 |
| 4.700 | 19.130 | 9.507 | 5.000 | 0.460 |

BASELINE SAG

ALLOWABLE D.O. IN MEHERRIN
 WITHOUT VIOLATING ANTIDEGRADATION:
D.O. = 9.111 mg/L

| | | | | |
|-------|--------|-------|-------|-------|
| 4.800 | 19.230 | 9.511 | 5.000 | 0.460 |
| 4.900 | 19.330 | 9.516 | 5.000 | 0.459 |
| 5.000 | 19.430 | 9.520 | 5.000 | 0.458 |

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)
04-04-1996 16:13:36

DATA FILE = BASEHIGH.MOD

REGIONAL MODELING SYSTEM

VERSION 3.2

DATA FILE SUMMARY

THE NAME OF THE DATA FILE IS: BASEHIGH.MOD

THE STREAM NAME IS: ROSES CREEK-> GREAT CREEK-> MEHERRIN RIVER
THE RIVER BASIN IS: CHOWAN
THE SECTION NUMBER IS: 3
THE CLASSIFICATION IS: III

STANDARDS VIOLATED (Y/N) = N
STANDARDS APPROPRIATE (Y/N) = Y

DISCHARGE WITHIN 3 MILES (Y/N) = N

THE DISCHARGE BEING MODELED IS: ALBERTA STP (VA0026816)

PROPOSED LIMITS ARE:

FLOW = .1 MGD
BOD5 = 25 MG/L
TKN = 20 MG/L
D.O. = 5 MG/L

THE NUMBER OF SEGMENTS TO BE MODELED = 4

7Q10 WILL BE CALCULATED BY: DRAINAGE AREA COMPARISON

THE GAUGE NAME IS: VDEQ #02015600
GAUGE DRAINAGE AREA = 30.7 SQ.MI.
GAUGE 7Q10 = 5.04 MGD
DRAINAGE AREA AT DISCHARGE = 2.43 SQ.MI.

STREAM A DRY DITCH AT DISCHARGE (Y/N) = N

ANTIDEGRADATION APPLIES (Y/N) = N

ALLOCATION DESIGN TEMPERATURE = 12.4 °C

SEGMENT INFORMATION

***** SEGMENT # 1 *****

SEGMENT ENDS BECAUSE: A DISCHARGE ENTERS AT END

SEGMENT LENGTH = 9.53 MI

SEGMENT WIDTH = 2 FT

SEGMENT DEPTH = .3 FT

SEGMENT VELOCITY = 1 FT/SEC

DRAINAGE AREA AT SEGMENT START = 2.43 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 27.42 SQ.MI.

ELEVATION AT UPSTREAM END = 289.5 FT

ELEVATION AT DOWNSTREAM END = 162.3 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

THE DISCHARGE AT THE SEGMENT END IS: LAWRENCEVILLE STP (VA0020354)

ITS CONCENTRATIONS ARE:

FLOW = .6 MGD

BOD5 = 25 MG/L

TKN = 20 MG/L

D.O. = 6.5 MG/L

SEGMENT INFORMATION

SEGMENT # 2

SEGMENT ENDS BECAUSE: A TRIBUTARY ENTERS AT END

SEGMENT LENGTH = .3 MI'

SEGMENT WIDTH = 9.5 FT

SEGMENT DEPTH = 1 FT

SEGMENT VELOCITY = .75 FT/SEC

DRAINAGE AREA AT SEGMENT START = 27.42 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 27.49 SQ.MI.

ELEVATION AT UPSTREAM END = 162.3 FT

ELEVATION AT DOWNSTREAM END = 159 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

TRIBUTARY DATA

FLOW = 7.51 MGD

BOD5 = 2 MG/L

TKN = 0 MG/L

D.O. = 9.539 MG/L

SEGMENT INFORMATION

||||| SEGMENT # 3 |||||

SEGMENT ENDS BECAUSE: A TRIBUTARY ENTERS AT END

SEGMENT LENGTH = 4.6 MI

SEGMENT WIDTH = 9.5 FT

SEGMENT DEPTH = 1.5 FT

SEGMENT VELOCITY = 1 FT/SEC

DRAINAGE AREA AT SEGMENT START = 45.74 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 57.19 SQ.MI.

ELEVATION AT UPSTREAM END = 159 FT

ELEVATION AT DOWNSTREAM END = 137 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

TRIBUTARY DATA

FLOW = 78.6 MGD

BOD5 = 2 MG/L

TKN = 0 MG/L

D.O. = 9.5432 MG/L

SEGMENT INFORMATION

***** SEGMENT # 4 *****

SEGMENT ENDS BECAUSE: THE MODEL ENDS

SEGMENT LENGTH = 5 MI

SEGMENT WIDTH = 30 FT

SEGMENT DEPTH = 2.7 FT

SEGMENT VELOCITY = 1.5 FT/SEC

DRAINAGE AREA AT SEGMENT START = 653.3 SQ.MI.

DRAINAGE AREA AT SEGMENT END = 740.15 SQ.MI.

ELEVATION AT UPSTREAM END = 137 FT

ELEVATION AT DOWNSTREAM END = 128 FT

THE CROSS SECTION IS: RECTANGULAR

THE CHANNEL IS: MOSTLY STRAIGHT

POOLS AND RIFFLES (Y/N) = N

THE BOTTOM TYPE = SAND

SLUDGE DEPOSITS = NONE

AQUATIC PLANTS = NONE

ALGAE OBSERVED = NONE

WATER COLORED GREEN (Y/N) = N

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)

04-04-1996 16:31:20

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment E

Facility Inspection Report

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Wastewater Facility Inspection Report

| | | | |
|---|---|--|---|
| Facility Name: | <u>Lawrenceville WWTP</u> | Facility No.: | <u>VA0020354</u> |
| City/County: | <u>Brunswick County</u> | Inspection Agency: | <u>DEQ</u> |
| Inspection Date: | <u>January 5, 2011</u> | Date Form Completed: | <u>January 19, 2011</u> |
| Inspector: | <u>Charles Stitzer</u> | Time Spent: | <u>18 hrs. w/ travel & report</u> |
| Reviewed By: | | Unannounced Insp.? | <u>No</u> |
| | | FY-Scheduled Insp.? | <u>Yes</u> |
| Present at Inspection: <u>Robert Williams, Robert Archer</u> | | | |
| TYPE OF FACILITY: | | | |
| <u>Domestic</u> | | <u>Industrial</u> | |
| <input type="checkbox"/> Federal | <input checked="" type="checkbox"/> Major | <input type="checkbox"/> Major | <input type="checkbox"/> Primary |
| <input checked="" type="checkbox"/> Non-Federal | <input type="checkbox"/> Minor | <input type="checkbox"/> Minor | <input type="checkbox"/> Secondary |
| Population Served: | <u>approx.: 5000</u> | | |
| Number of Connections: | <u>approx.: 1050</u> | | |
| TYPE OF INSPECTION: | | | |
| <input checked="" type="checkbox"/> Routine | Date of last inspection: <u>September 8, 2009</u> | | |
| <input type="checkbox"/> Compliance | Agency: <u>DEQ/PRO</u> | | |
| <input type="checkbox"/> Reinspection | | | |
| EFFLUENT MONITORING, Effluent Date: <u>January 5, 2011</u> | | | |
| CBOD: <u>*</u> mg/L | TSS: <u>2.4</u> mg/L | Flow: <u>0.681</u> MGD | |
| Other: <u>pH 7.01 SU, FC 1, DO 9.36 mg/L</u> | | | |
| * CBOD, NH ₃ - N, TKN analyzed by B&B Laboratory. Data for 1/5/11 not available at time of inspection. | | | |
| CHANGES AND/OR CONSTRUCTION | | | |
| DATA VERIFIED IN PREFACE | <input type="checkbox"/> Updated | <input checked="" type="checkbox"/> No changes | |
| Has there been any new construction? | <input type="checkbox"/> Yes* | <input checked="" type="checkbox"/> No | |
| If yes, were plans and specifications approved? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |
| DEQ approval date: | <u>N/A</u> | | |

(A) PLANT OPERATION AND MAINTENANCE

1. Class and number of licensed operators: Class I – 0, Class II - 2 Class III - 1, Class IV – 2, OIT – 1
2. Hours per day plant is staffed: 12 hours/day (6 a.m. – 6 p.m.), 7 days/week
3. Describe adequacy of staffing: Good Average Poor*
4. Does the plant have an established program for training personnel? Yes No
5. Describe the adequacy of the training program: Good Average Poor*
6. Are preventive maintenance tasks scheduled? Yes No*
7. Describe the adequacy of maintenance: Good Average Poor*
8. Does the plant experience any organic/hydraulic overloading? Yes* No

If yes, identify cause and impact on plant: The WWTP experiences very little ACUTE impacts related to high I&I . However, excessive I&I presents a challenge to the operators because of variable and dilute influent. An I&I reduction program is ongoing.

9. Any bypassing since last inspection? Yes* No
10. Is the on-site electric generator operational? Yes No* N/A
11. Is the STP alarm system operational? Yes No * N/A
12. How often is the standby generator exercised?
Power Transfer Switch? Weekly Monthly Other:
Alarm System? Weekly Monthly Other: Daily
13. When were the cross connection control devices last tested on the potable water service? 10/22/09*
14. Is sludge disposed in accordance with the approved sludge disposal plan? Yes No* N/A
15. Is septage received by the facility? Yes No
Is septage loading controlled? Yes No * N/A
Are records maintained? Yes No* N/A
16. Overall appearance of facility: Good Average Poor*

Comments: #3 The current level of staffing is adequate to avoid most scheduling problems during holidays, sicknesses, or unplanned plant maintenance. #4 Training includes OJT, Short School, DEQ Lab Workshops, and an incentive program for operator license upgrade. #11 Alarm signals report to operator's control/enunciator panel and local audio and visual alarm signals. #13 RPZ certification has expired. The RPZ must be certified asap and annually thereafter.

(C) SAMPLING

- | | | | |
|--|---|------------------------------|------------------------------|
| 1. Are sampling locations capable of providing representative samples? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 2. Do sample types correspond to those required by the permit? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 3. Do sampling frequencies correspond to those required by the permit? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 4. Are composite samples collected in proportion to flow? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 5. Are composite samples refrigerated during collection? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 6. Does plant maintain required records of sampling? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 7. Does plant run operational control tests? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |

Comments: The plant performs pH, D.O., TSS, E. Coli, MLSS, MLVSS, and settleability on mixed liquor.

(D) TESTING

- | | |
|------------------------------|--|
| 1. Who performs the testing? | <input checked="" type="checkbox"/> Plant/ Lab: pH, D.O., TSS, E. Coli <input type="checkbox"/> Central Lab |
| | <input checked="" type="checkbox"/> Commercial Lab - Name: <u>B & B Lab. and Consultants</u> <u>CBOD₅, TKN, NH₃-N</u> |

If plant performs any testing, complete 2-4.

- | | | | |
|---|--|------------------------------|---|
| 2. What method is used for chlorine analysis? | <u>No Cl₂ testing - UV disinfection</u> | | |
| 3. Is sufficient equipment available to perform required tests? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |
| 4. Does testing equipment appear to be clean and/or operable? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |

Comments: Please see enclosed DEQ Laboratory Inspection Report.

(E) FOR INDUSTRIAL FACILITIES W/ TECHNOLOGY BASED LIMITS N/A

- | | | | |
|---|------------------------------|------------------------------|---|
| 1. Is the production process as described in the permit application? (If no, describe changes in comments) | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |
| 2. Do products and production rates correspond to the permit application? (If no, list differences in comments section) | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |
| 3. Has the State been notified of the changes and their impact on plant effluent? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |

Comments: None

FOLLOW UP TO COMPLIANCE RECOMMENDATIONS FROM THE SEPTEMBER 8, 2009 DEQ INSPECTION:

Have RPZ recertified ASAP and annually thereafter. RPZ was certified shortly after last inspection (10/22/09) but has again expired.

FOLLOW UP TO GENERAL RECOMMENDATIONS FROM THE SEPTEMBER 8, 2009 DEQ INSPECTION:

Add RPZ re-certification and lab equipment thermister and thermometer checks to computer generated maintenance tasks to provide a reminder that these annual tasks are due. ***This has not yet been done, however, a computer generated maintenance system is currently under evaluation by the WWTP.***

Maintain greater inventory of belt filter press spare parts to reduce down time. ***This has not been done, however, other steps have been taken by the WWTP staff to reduce filter press down time (such as working with a local metal fabricator to make spare parts faster than can be provided by the belt presses' manufacturer).***

INSPECTION REPORT SUMMARY**Compliance Recommendations/Request for Corrective Action:**

Have RPZ recertified ASAP and annually thereafter.

General Recommendations/Observations:

Add RPZ re-certification and lab equipment thermister and thermometer checks to computer generated maintenance tasks to provide a reminder that these annual tasks are due.

Breakdown of the sludge filter press has become somewhat problematic. However, WWTP staff have developed a relationship with a good local machine shop that has been able to manufacture new parts in a short time frame. The ability to have the needed parts made locally has kept filter-press downtime to a minimum. Also, the internal purchase requisition system which had caused replacement delays in the past has become more responsive. Administrative delays have not been a problem since last inspection..

The WWTP lab has achieved full VELAP certification. This is a significant achievement.

Comments:

The WWTP sludge filter press was again out-of-service. However, there was room for storage of additional solids in the system before the quality of the effluent would be negatively impacted. Replacement parts had been ordered from a local machine shop. A couple of days post inspection the Chief Operator reported that the needed parts had been manufactured and installed. One of the 2 belt filter presses had been returned to service. Since the belt filter presses have proven to contain high wear parts that result in frequent downtime, WWTP staff have adapted to be able to effect routine repairs quickly.

UNIT PROCESS: Sewage Pumping

The following satellite pump stations are maintained: Mayfield, Green Acres, Pine Crest, Brookscroft and WTP Pump Stations.

All stations are equipped with two pumps that are operated in lead/lag mode. All stations are equipped with local audio and visual alarm signals. Pine Crest and Green Acres pump stations are equipped with auto-dial systems. Alarm systems are tested weekly and the stations are checked daily.

The WTP (water treatment plant) pump station, which receives no domestic wastewater, has one-day storage capacity available. The Mayfield and Jr. High Pump Stations are equipped with portable pump quick connections. The Pine Crest Pump Station has an onsite backup generator.

A new pump station is proposed to be added to the system at the Regional Jail in 2011-2012

UNIT PROCESS: Sewage Pumping

1. Name of station: Influent Lift Station
2. Location (if not at STP): N/A
3. Following equipment operable:
- | | | |
|-----------------------|---|--|
| a. All pumps? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* |
| b. Ventilation? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* <input type="checkbox"/> N/A |
| c. Control system? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* <input type="checkbox"/> N/A |
| d. Sump pump? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* <input checked="" type="checkbox"/> N/A |
| e. Seal water system? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* <input checked="" type="checkbox"/> N/A |
4. Reliability considerations:
- | | | | |
|---|--|--|---|
| a. Class | <input type="checkbox"/> I | <input checked="" type="checkbox"/> II | <input type="checkbox"/> III |
| b. Alarm system operable? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| c. Alarm conditions monitored: | | | |
| 1. high water level: | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 2. high liquid level in dry well: | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |
| 3. main electric power: | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 4. auxiliary electric power: | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |
| 5. failure of pump motors to start: | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | <input type="checkbox"/> N/A |
| 6. test function: | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No* | |
| 7. other: <u>low level</u> | | | |
| d. Backup for alarm system operational? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* | <input checked="" type="checkbox"/> N/A |
| e. Alarm signal reported to (identify): | <u>local audible & visual, and control panel & auto-dial</u> | | |
| f. Continuous operability provisions: | | | |
| 1. Generator hook up? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | |
| 2. Two sources of electricity? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No (on-site generator) | |
| 3. Portable pump? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 4. 1 day storage? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 5. other: <u>N/A</u> | | | |
5. Does station have bypass?
- | | | |
|-------------------------------|-------------------------------|--|
| a. Evidence of bypass use? | <input type="checkbox"/> Yes* | <input checked="" type="checkbox"/> No |
| b. Can bypass be disinfected? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* <input checked="" type="checkbox"/> N/A |
| c. Can bypass be measured? | <input type="checkbox"/> Yes | <input type="checkbox"/> No* <input checked="" type="checkbox"/> N/A |
6. How often is station checked? daily
7. General condition: Good Fair Poor*

Comments: The lift station is equipped with three pumps set in lead/lag mode that rotate in operation. Emergency generator is tested monthly.

UNIT PROCESS: Flow Measurement

Influent Intermediate Effluent

1. Type measuring device: 18" Parshall Flume, stilling well, and ultrasonic sensor w/chart recorder, totalizer and instantaneous (LCD) display
2. Present reading: Instantaneous – 1060 gpm @ 1421 hrs on 01/05/11
3. Bypass channel? Yes No
Metered? Yes No* N/A
4. Return flows discharged upstream from meter? Yes No
If Yes, identify: Underflow from drying beds, filtrate from Belt Presses, Gravity Thickener discharge and digester supernatant
5. Device operating properly? Yes No*
6. Date of last calibration: 08/12/10
7. Evidence of following problems:
 - a. Obstructions? Yes* No
 - b. Grease? Yes* No
8. General condition: Good Fair Poor*

Comments: Weekly maintenance is performed to keep the stilling well clear. A splitter box, immediately following influent flow measurement, splits flow to the two Oxidation Ditches (PLC).

UNIT PROCESS: Screening/Comminution

1. Number of units: Manual: 1(bypass) Mechanical: 1
 Number of units in operation: Manual: 0 Mechanical: 1
2. Bypass channel provided? [x] Yes [] No
 Bypass channel in use? [] Yes [x] No [] N/A
3. Area adequately ventilated? [x] Yes [] No*
4. Alarm system for equipment failure or overloads? [x] Yes [] No [] N/A
 If present, is the alarm system operational? [x] Yes [] No * [] N/A
5. Proper flow-distribution between units? [] Yes [] No * [x] N/A
6. How often are units checked and cleaned? daily
7. Cycle of operation: float and timer activated
8. Volume of screenings removed: ~ 1 yd³ /week
9. General condition: [x] Good [] Fair [] Poor*

Comments: #4 Alarms for mechanical failure and high-liquid level. Screenings unit includes a de-watering screw press and hopper.

UNIT PROCESS: Grit Removal

1. Number of units: 2 (one mechanical, one manual for bypass)

Number of units in operation: 1 (mechanical – cyclone)

2. Unit adequately ventilated? Yes No *

3. Operation of grit collection equipment: Manual Time clock Continuous duty

4. Proper flow-distribution between units? Yes No * N/A

5. Daily volume of grit removed: ~ 10 gallons/week

6. All equipment operable? Yes No *

7. General condition: Good Fair Poor*

Comments: Cyclone grit collector is equipped with a de-watering screw and hopper.

UNIT PROCESS: Activated Sludge Aeration

1. Number of units: 2 (Kruger Isolation Ditches)
Number of units in operation: 2
2. Mode of operation: sequential batch treatment
3. Proper flow distribution between units? Yes No* N/A
4. Foam control operational? Yes No* N/A
5. Scum control operational? Yes No* N/A
6. Evidence of the following problems:
- a. Dead spots? Yes* No
 - b. Excessive foam? Yes* No
 - c. Poor aeration? Yes* No
 - d. Excessive aeration? Yes* No
 - e. Excessive scum? Yes* No
 - f. Aeration equipment malfunction? Yes* No
 - g. Other:

7. Mixed liquor characteristics (as available) ***average or range for 01/05/11 Oxidation ditch 1 & 2***

| | |
|---------------------------|--|
| pH: <u>6.66/6.97 SU</u> | MLSS: <u>5040/4960 mg/L</u> |
| DO: <u>4.01/4.69 mg/L</u> | SDI: <u>N/A</u> |
| SVI: <u>178.6/175</u> | Color: <u>Brown - normal</u> |
| Odor: <u>earthy</u> | Settleability: <u>900/870 ml/L in 30 minutes</u> |
| | Other: <u>MLVSS: 3500/3490 mg/L</u> |

8. Return/waste sludge:
- a. return rate: N/A - sludge not wasted is RAS; O-ditch operated in 5 hr. cycles
 - b. waste rate: Based on visual observations, ~0.50- 0.60 MGD
 - c. frequency of wasting: daily (high MLSS and Settleability is result of off-line belt filter press. Solids are abnormally high in the system.)
9. Aeration system control:
- Time Clock Manual Continuous
 - Other oxygen sensors tied to PLC
10. Effluent control devices working properly? Yes No N/A
11. General condition: Good Fair Poor *

Comments: #7 Mixed liquor was dark and had a high solids content . #8 Gravity Thickener and Aerobic Digester had abnormally high solids content due to a breakdown of the belt filter press. Press was returned to service two days post inspection and excessive solids were being removed from system. #10 PLC controlled effluent weirs. Liquid level monitored by ultra-sonic sensors. Aeration (PLC to the digester with dissolved oxygen sensors) provided by submerged rotors. Scum control boxes are manually dumped to the digester as needed.

UNIT PROCESS: Sludge Pumping**(Oxidation Ditches to Gravity Thickener)**

1. Number of Pumps: 2 (one submersible pump in each ditch)
Number of pumps in operation: 1
2. Type of sludge pumped: Primary Secondary Return Activated
 Combination Other: WAS
3. Type of pump: Plunger Diaphragm Screwlift
 Centrifugal Progressing cavity Other:
4. Mode of operation: Manual Automatic Other:
5. Sludge volume pumped: ~30,000 gal pumped from ditch to digestor on 1/5/11 (slightly less than normal due to broken belt filter press and resulting excessive accumulated solids in system.)
6. Alarm system for equipment failures or overloads operational? Yes No* N/A
7. General condition: Good Fair Poor*

Comments: Alarms include high liquid level and failure of pumps to start. #5 The need for sludge pumping is determined by visual examination and the experience of the operators.

UNIT PROCESS: Sludge Pumping**(Gravity Thickener to Aerobic Digester)**

1. Number of Pumps: 3 (formerly the Trickling Filter Recirculation Pump Station)
Number of pumps in operation: 1
2. Type of sludge pumped: Primary Secondary Return Activated
 Combination Other: thickened WAS
3. Type of pump: Plunger Diaphragm Screwlift
 Centrifugal Progressing cavity Other:
4. Mode of operation: Manual Automatic Other:
5. Sludge volume pumped: ~2611 gal on 01/04/11
6. Alarm system for equipment failures or overloads operational? Yes No* N/A
7. General condition: Good Fair Poor*

Comments:

UNIT PROCESS: Gravity Thickening

1. Number of units: 1
- Number of units in operation: 1
2. Types of sludge(s) fed to the thickener: Primary WAS Combination
 Other:
3. Solids concentration in the influent sludge: Usually 2-3 % (estimated based on sludge level in thickener)
- Solids concentration in thickened sludge: Usually 2-3 % (estimated based on sludge level in thickener)
4. Sludge feeding: Continuous Intermittent
5. Signs of short-circuiting and/or overloads? Yes* No N/A
6. Effluent weirs level? Yes No * N/A
7. Sludge collection system work properly? Yes No * N/A
8. Influent, effluent baffle systems work properly? Yes No * N/A
9. Chemical addition? Yes No * N/A
Identify chemical/dose: N/A
10. General condition: Good Fair Poor*

Comments: One of the former primary clarifiers was converted to a Gravity Thickener. The second former clarifier is currently not used. Gravity Thickener receives WAS from the Oxidation Ditches. Sludge is pumped from the thickener to the Primary Digester. The operators try to maintain no more than three feet sludge depth in the Gravity Thickener, although at this inspection, due to worn cone rollers in both belt filter presses and the resulting inability to remove sludge from the Digester for a few days, the sludge level was near the top of the weirs.

UNIT PROCESS: Aerobic Digestion

1. Number of units: 2 (one primary, one secondary in series)
- Number of units in operation: 2
2. Type of sludge treated: Primary WAS Other:
3. Frequency of sludge application to digesters: 12/day
4. Supernatant return rate: as needed – unknown
5. pH adjustment provided? Yes No
- Utilized: Yes No N/A
6. Tank contents well-mixed and relatively free of odors? Yes No*
7. If diffused aeration is used, do diffusers require frequent cleaning? Yes No N/A
8. Location of supernatant return: Head Primary Other
9. Process control testing: for 01/05/11
- a. percent volatile solids: Yes 69.4/70.4 % No
 - b. pH: Yes 6.66/6.97 SU No
 - c. alkalinity: Yes mg/L No
 - d. dissolved oxygen: Yes Not recorded mg/L No
 - e. temp Yes Not recorded °C No
10. Foaming problem present? Yes * No
11. Signs of short-circuiting or overloads?: Yes * No
12. General condition: Good Fair Poor*

Comments: Each digester is equipped with one, two-speed floating mechanical aerator. Sludge flows by gravity from the primary digester to the secondary digester. #9 d, e, DO and temp had not yet been recorded at time of inspection.

UNIT PROCESS: Sludge Pumping**(Digester to Belt Press)**

1. Number of Pumps: 2
Number of pumps in operation: 0
2. Type of sludge pumped: Primary Secondary Return Activated Combination
 Other: digested sludge
3. Type of pump: Plunger Diaphragm Screwlift
 Centrifugal Progressing cavity Other: grinder
4. Mode of operation: Manual Automatic Other:
5. Sludge volume pumped: As needed to maintain approximately 3 feet of sludge in thickener
6. Alarm system for equipment failures or overloads operational? Yes No* N/A
7. General condition: Good Fair Poor*

Comments: Digested sludge from the second digester is pumped via a grinder pump in the belt press building. A plunger pump is used to pump the sludge to the flocculation tank where polymer is added and mixed prior to the belt press. At the time of the inspection, the digester contained excessive solids due to broken belt filter press. One of two belt filter presses was repaired and placed on line two days after the inspection and the excessive solids in the system were being reduced.

UNIT PROCESS: Pressure Filtration (Sludge)**(Belt Press)**

1. Number of units: 2
Number in operation: 0
2. Percent solids in influent sludge: 2-3 %
3. Percent solids in discharge cake: 10% on 11/09/10
4. Filter run time: varies
5. Amount cake produced: 5.08 tons on 11/09/10
6. Conditioning chemicals used: Yes No
Type and Dose: polymer as needed to condition sludge
7. Sludge pumping: Manual Automatic
8. Recirculating system included on acid wash: Yes No N/A
9. Signs of overloads? Yes * No
10. General condition: Good Fair Poor*

Comments: #1 Two cone rollers in different presses failed in late December. The WWTP was able to have a local metal fabrication shop machine replacement parts quicker than could be acquired from the presses' manufacturer. This most recent down time has resulted in accumulation of excess sludge in the system, but far less than when the last major press failure occurred (stator replacement). By necessity, the WWTP staff has developed a repair parts acquisition solution that has reduced filter press down time and retains excellent effluent quality. To avoid similar problems in the future, consider identifying the presses' wear parts and keep an inventory of critical parts that cannot be quickly manufactured locally. Also consider rehabilitating the sludge drying beds for use if filter press repairs cannot be quickly implemented.

UNIT PROCESS: Drying Beds

1. Number of units: 8
 Number of units in operation: 0
 Number of beds with sludge: 0
2. Cover in good condition? Yes No N/A
3. Typical sand depth in beds: ~12 inches
4. Typical drying time: N/A
5. Frequency of usage: Out of service for several years
6. Underflow recycle location: Influent pump station
7. Sludge distributed evenly across bed(s)? Yes No* N/A
8. Following problems noted:
- a. Odors? Yes* No
 - b. Flies? Yes* No
 - c. Weed growth? Yes* No
 - d. Leakage from bed(s)? Yes* No
9. If the facility does not have an approved sludge plan, what is the current method of sludge disposal?
The approved plan calls for landfill disposal.
10. General condition: Good Fair Poor*

Comments: Sludge drying beds were to be used as a back up system to the belt filter press. They are currently not in operation and have been allowed to deteriorate from disuse (weeds and debris on filter beds). Rehabilitating and maintaining the sludge drying beds should be considered to insure against problems which could occur during long belt filter press outages.

UNIT PROCESS: Ultraviolet (UV) Disinfection

1. Number of UV lamps/assemblies:
Number in operation: 6 Modules – 40 bulbs/module
4 – 6 (depending on flow)
2. Type of UV system and design dosage: vertical UV Modules by Ultratech
3. Proper flow distribution between units? Yes No* N/A
4. Method of UV intensity monitoring? light intensity meter
5. Adequate ventilation of ballast control boxes? Yes No* N/A
6. Indication of on/off status of all lamps provided? Yes No*
7. Lamps assemblies easily removed for maintenance? Yes No*
8. Records of lamp operating hours & replacement dates provided? Yes No*
9. Routine cleaning system provide
Operated properly?
Frequency of routine cleaning: daily by diffused air; cleaned once/week
to ten days with acid/water mix
10. Lamp energy control system operating properly? Yes No*
11. Date of last system overhaul:
 a. UV unit completely drained Yes No*
 b. all surfaces cleaned Yes No*
 c. UV transmissibility checked Yes No*
 d. output of selected lamps checked Yes No*
 e. output of tested lamps Yes No*
 f. total operating hours, oldest lamp/assembly Yes No*
 g. number of spare lamps and ballasts available: Last total bulb replacement was in 2009
computer program records total hrs.
lamps: ~150 ballasts: ~3
12. UV protective eyeglasses provided: Yes No*
13. General condition: Good Fair Poor*

Comments: #11 In the past, changing all bulbs at the same time resulted in some e. coli exceedences. It was determined that new bulbs need to "burn in" for a few hundred hours before they reach maximum output. Therefore, the WWTP staff has developed a new staggered replacement regimen to insure that sufficient intensity is maintained. When monitoring indicates a drop in intensity, new bulbs will be added a few at a time. This should insure that the average light intensity remains above the critical level needed for effectiveness.

UNIT PROCESS: Flow Measurement

Influent Intermediate Effluent

1. Type measuring device: 18" Parshall flume and ultrasonic sensor with chart recorder, totalizer and instantaneous display
2. Present reading: 529 gpm @ 1437 hours on 01/05/11
3. Bypass channel?
Metered? Yes No
 Yes No* N/A
4. Return flows discharged upstream from meter?
If Yes, identify: N/A
5. Device operating properly? Yes No*
6. Date of last calibration: 8/12/10
7. Evidence of following problems:
 - a. Obstructions? Yes* No
 - b. Grease? Yes* No
8. General condition: Good Fair Poor*

Comments: An energy dispersion device (baffle) has been installed in the channel immediately above the flume.

UNIT PROCESS: Post Aeration

1. Number of units: 1
 Number of units in operation: 1
2. Proper flow distribution between units? Yes No* N/A
3. Evidence of following problems:
- a. Dead spots? Yes* No
 - b. Excessive foam? Yes* No
 - c. Poor aeration? Yes* No
 - d. Mechanical equipment failure? Yes* No N/A
4. How is the aerator controlled? Time clock Manual Continuous
 Other _____ N/A
5. What is the current operating schedule? continuous – step cascade
6. Step weirs level? Yes No* N/A
7. Effluent D.O. level: Not checked
8. General condition: Good Fair Poor*

Comments:

UNIT PROCESS: Effluent/Plant Outfall

1. Type outfall: Shore based Submerged
2. Type if shore based: Wingwall Headwall Rip Rap N/A
3. Flapper valve? Yes No
4. Erosion of bank? Yes* No N/A
5. Effluent plume visible? Yes * No

Comments:

6. Condition of outfall and supporting structures: Good Fair Poor *
7. Final effluent, evidence of following problems:
- a. Oil sheen? Yes* No
 - b. Grease? Yes* No
 - c. Sludge bar? Yes* No
 - d. Turbid effluent? Yes* No
 - e. Visible foam? Yes* No
 - f. Unusual odor? Yes* No

Comments: The final effluent was clear.

cc:

- Owner: c/o Mr. C.J. Dean
- Operator: Robert Williams
- Local Health Department:
- VDH Engineering Field Office:
- VDH/Central Office - DWE
- DEQ - OWCP, attn: Steve Stell
- DEQ - Regional Office File
- EPA - Region III

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment F

Effluent Information

| TKN (mg/L & kg/d) | | | |
|-------------------|--------------------|--------------|-------------------|
| | Monthly Avg. Conc. | Monthly Avg. | Weekly Avg. Conc. |
| 10-Nov-07 | 1.2 | 3.34 | 1.2 |
| 10-Dec-07 | 1.6 | 4.06 | 1.7 |
| 10-Jan-08 | 1.6 | 4.36 | 1.7 |
| 10-Jun-08 | 1.5 | 4.79 | 2.1 |
| 10-Jul-08 | 1.4 | 3.76 | 1.6 |
| 10-Aug-08 | 1.2 | 3.12 | 1.2 |
| 10-Sep-08 | 1.2 | 2.99 | 1.3 |
| 10-Oct-08 | 1.2 | 3.29 | 1.2 |
| 10-Nov-08 | 1.2 | 3.11 | 1.2 |
| 10-Dec-08 | 1.4 | 3.8 | 1.8 |
| 10-Jan-09 | 1.2 | 3.87 | 1.3 |
| 10-Jun-09 | 1.6 | 4.95 | 1.7 |
| 10-Jul-09 | 1.6 | 4.22 | 1.7 |
| 10-Aug-09 | 1.3 | 3.44 | 1.3 |
| 10-Sep-09 | 1.3 | 3.61 | 1.4 |
| 10-Oct-09 | 1.8 | 5.03 | 1.9 |
| 10-Nov-09 | 1.8 | 3.99 | 2.1 |
| 10-Dec-09 | 1.5 | 4.8 | 1.9 |
| 10-Jan-10 | 1.4 | 5.35 | 1.7 |
| 10-Jun-10 | 0.9 | 2.38 | 1.2 |
| 10-Jul-10 | 1.2 | 2.72 | 1.3 |
| 10-Aug-10 | 1.2 | 2.68 | 1.4 |
| 10-Sep-10 | 1.3 | 3.02 | 1.4 |
| 10-Oct-10 | 1.4 | 3.05 | 1.4 |
| 10-Nov-10 | 1.7 | 4.67 | 1.8 |
| 10-Dec-10 | 1.1 | 2.57 | 1.3 |
| 10-Jan-11 | 1.2 | 2.71 | 1.2 |
| 10-Jun-11 | 1.1 | 2.7 | 0.5 |
| 10-Jul-11 | 1 | 2.2 | 0.4 |
| 10-Aug-11 | 1 | 2.31 | 0.5 |
| 10-Sep-11 | 2 | 4.71 | 1.8 |
| 10-Oct-11 | 2.2 | 5.84 | 1.7 |
| 10-Nov-11 | 1.4 | 3.57 | 0.6 |
| 10-Dec-11 | 1.3 | 3.63 | 0.6 |
| 10-Jan-12 | 1.3 | 3.42 | 0.6 |
| Minimum | 0.90 | 2.20 | 0.40 |
| Maximum | 2.20 | 5.84 | 2.10 |
| Average | 1.38 | 3.66 | 1.36 |
| 2007 Limit | 3.0 | | |
| % Ratio | 46 | | |
| Baseline MF | 5/Wk | | |
| MF Reduction | 2/Wk | | |

| Ammonia (mg/L) | | |
|----------------|--------------------|-------------------|
| | Monthly Avg. Conc. | Weekly Avg. Conc. |
| 10-Feb-08 | <QL | <QL |
| 10-Mar-08 | 0.71 | 0.71 |
| 10-Apr-08 | 0.61 | 0.61 |
| 10-May-08 | 0.36 | 0.36 |
| 10-Feb-09 | 0.33 | 0.33 |
| 10-Mar-09 | 3 | 3 |
| 10-Apr-09 | 1.3 | 1.3 |
| 10-May-09 | 0.63 | <QL |
| 10-Feb-10 | 1.5 | 1.5 |
| 10-Mar-10 | <QL | <QL |
| 10-Apr-10 | 0.8 | <QL |
| 10-May-10 | <QL | <QL |
| 10-Feb-11 | 0.55 | 0.55 |
| 10-Mar-11 | 0.34 | 0.34 |
| 10-Apr-11 | 0.86 | <QL |
| 10-May-11 | 0.22 | 0.22 |
| 10-Feb-12 | 0.52 | 0.52 |
| Minimum | 0.22 | 0.22 |
| Maximum | 3.00 | 3.00 |
| Average | 0.84 | 0.86 |

| Zinc, Tot.Rec. (mg/L) | |
|-----------------------|--------------------|
| | Monthly Avg. Conc. |
| 10-Apr-08 | <QL |
| 10-Oct-08 | <QL |
| 10-Apr-09 | <QL |
| 10-Oct-09 | <QL |
| 10-Apr-10 | <QL |
| 10-Oct-10 | <QL |
| 10-Apr-11 | <QL |
| 10-Oct-11 | 0.025 |
| 2007 Limit | 0.075 |
| % Ratio | 33 |
| Baseline MF | 1/Mo |
| MF Reduction | 1/Quar. |

The baseline monitoring frequency for Ammonia is currently 5 Days per Week in accordance with GM10-2003 (MN-2, Pg.2). For the 2012 permit, it was determined that an Ammonia limitation is not necessary to maintain Water Quality Standards in the receiving stream, and therefore the former limitation of 13.5 mg/L has been carried forward in order to prevent backslicing. The former limitation was derived during a period of time in which the baseline monitoring frequency for Ammonia was 1 per Month. If the former numeric limitation were carried forward to the 2012 permit and the monitoring frequency were increased to match the current baseline monitoring frequency, the result would be a relaxed Ammonia limitation, and thus a violation of antibacksliding policies. In order to maintain antibacksliding policies, both the monitoring frequency of 1 per Month and the numeric limitation of 13.5 mg/L have been carried forward to the 2012 permit.

Lawrenceville Wastewater Treatment Plant (VA0020354)

Effluent Screening - 2012 Permit Reissuance

| CASRN# | CHEMICAL | REQUIRED EPA ANALYSIS NO. | REQUIRED QL (µg/L) | TEST REQUIRED IN: | | REPORTING RESULTS BY SAMPLE DATE | | | | | | | | |
|----------------------------------|--|---------------------------|--------------------|-------------------|---------|----------------------------------|---|----------------------|--------------------|-------------------|--------------------|-------------------|---------------|--|
| | | | | | | 8/10/2010 | | 9/1/2010 & 9/15/2010 | | 1/25/2012 | | 2/8/2012 | | |
| | | | | Att. A | Form 2A | EPA ANALYSIS USED | RESULT (µg/L) | EPA ANALYSIS USED | RESULT (µg/L) | EPA ANALYSIS USED | RESULT (µg/L) | EPA ANALYSIS USED | RESULT (µg/L) | |
| 88-06-2 | 2,4,6-Trichlorophenol | 625 | 10 | ✓ | ✓ | | 625 | | <10.0 | 625 | <10.0 | 625 | <10.0 | |
| RADIONUCLIDES | | | | | | | | | | | | | | |
| Beta Particle & Photon | (4) | (5) | ✓ | | | | | | | | | | | |
| Gross Alpha Particle Activity | (4) | (5) | ✓ | | | | | | | | | | | |
| Combined Radium 226 and | (4) | (5) | ✓ | | | | | | | | | | | |
| Uranium | (4) | (5) | ✓ | | | | | | | | | | | |
| MISCELLANEOUS | | | | | | | | | | | | | | |
| 776-41-7 | Ammonia as NH3-N | 350.1 | 200 | ✓ | | | 350.1 | 930 | LACH 10-107-06-1-C | 680 | LACH 10-107-06-1-C | 590 | | |
| 16887-00-6 | Chlorides | (4) | (5) | ✓ | | | | | | | | | | |
| 7782-50-5 | Chlorine Produced Oxidant | (4) | (5) | ✓ | | | | | | | | | | |
| 7782-50-5 | Chlorine, Total Residual | (4) | 100 | ✓ | | | | | | | | | | |
| 57-12-5 | Cyanide, Free | (4) | 10 | ✓ | | | 335.4 | <10 (total) | LACH 10-204-00-1-X | <10 (total) | LACH 10-204-00-1-X | <10 (total) | | |
| 94-75-7 | 2,4-Dichlorophenoxy acetic acid (synonym = 2,4-D) | (4) | (5) | ✓ | | | | | | | | | | |
| 1746-01-6 | Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) | 1613 | 0.00001 | ✓ | | | | | | | | | | |
| N/A | <i>E. coli</i> / Enterococcus (N/NCML) | (4) | (5) | ✓ | | | Reported on Form 2A, see summary page of Form 2A testing results. | | | | | | | |
| N/A | Foaming Agents (as MBAS) | (4) | (5) | ✓ | | | | | | | | | | |
| 6/4/7783 | Hydrogen Sulfide | (5) | (5) | ✓ | | | ASTM D 4658-03 | <100 | | | | | | |
| 14797-55-8 | Nitrate as N (mg/L) | (4) | (5) | ✓ | ✓ | | 353.2 | 790 | LACH 10-107-04-1-A | 1120 | LACH 10-107-04-1-A | 1280 | | |
| N/A | Sulfate (mg/L) | (4) | (5) | ✓ | | | | | | | | | | |
| N/A | Total Dissolved Solids | (4) | (5) | ✓ | ✓ | | SM 2540C | 223000 | SM 2540C | 219000 | SM 2540C | 199000 | | |
| 60-10-5 | Tributyltin | NBSR 85-3-295 | (5) | ✓ | | | Unger | <0.0030 | | | | | | |
| 93-72-1 | 2-(2,4,5-Trichlorophenoxy) propionic acid (synonym = | | | | | | | | | | | | | |
| | Hardness (mg/L as CaCO ₃) | (4) | (5) | ✓ | ✓ | | SM 2340B | 39500 | SM 2340B | 36700 | SM 2340B | 38000 | | |
| OTHER POLLUTANTS REPORTED | | | | | | | | | | | | | | |
| | Total Kjeldahl Nitrogen | -- | -- | | ✓ | | 350.1 | 930 | LACH 10-107-06-2-I | 680 | LACH 10-107-06-2-I | 1330 | | |
| | Total Phosphorus | -- | -- | | ✓ | | 365.1 | 280 | LACH 10-115-01-1-E | <200 | LACH 10-115-01-1-E | 210 | | |
| | Oil & Grease HEM | -- | -- | | ✓ | | 1664A | 6400 | 1664A | <5000 | 1664A | <5000 | | |



= Reported greater than QL
 = Required for 2012 application
 = Not required for 2012 application, but may have been reported by laboratory

Lawrenceville Wastewater Treatment Plant (VA0020354)
 Data Reported on Form 2A - 2012 Permit Reissuance

Outfall Number:

001

| Parameter | Maximum Daily Value | | Average Daily Value | | |
|----------------------|---------------------|-------|---------------------|-------|-------------------|
| | Value | Units | Value | Units | Number of Samples |
| pH (minimum) | 6.2 | s.u. | | | |
| pH (maximum) | 8.24 | s.u. | | | |
| Flow Rate | 2.847050 | MGD | 0.715074 | MGD | 1826 |
| Temperature (Winter) | 19.4 | °C | 13.4 | °C | Daily/Permit |
| Temperature (Summer) | 28.7 | °C | 25.9 | °C | Daily/Permit |

| Pollutant | Maximum Daily Discharge | | | Average Daily Discharge | | | Analytical Method | ML/MDL |
|--|-------------------------|--------|-----------|-------------------------|-------------------|------|-------------------|--------------|
| | Conc. | Units | Conc. | Units | Number of Samples | | | |
| CONVENTIONAL AND NON-CONVENTIONAL COMPOUNDS | | | | | | | | |
| Biochemical Oxygen Demand (report one) | BOD-5 | | | | | | | |
| | CBOD-5 | 31 | mg/L | 0.62 | mg/L | 417 | SM 5210 | 5 mg/L |
| Fecal Coliform | | 888 | cfu/100mL | 19 | cfu/100mL | 1290 | SM 9223 | 1 cfu/100 mL |
| Total Suspended Solids (TSS) | | 158.93 | mg/L | 9.78 | mg/L | 394 | 160.2 | 5 mg/L |

| Pollutant | Maximum Daily Discharge | | | Average Daily Discharge | | | Analytical Method | ML/MDL |
|--|-------------------------|-------|-------|-------------------------|-------------------|------------|-------------------|--------|
| | Conc. | Units | Conc. | Units | Number of Samples | | | |
| CONVENTIONAL AND NON-CONVENTIONAL COMPOUNDS | | | | | | | | |
| Ammonia (as N) | 3.00 | mg/L | 0.84 | mg/L | 23 | 350.1 | 0.20 | |
| Chlorine (TRC) | | | | N/A | | | | |
| Dissolved Oxygen | 12.06 | mg/L | 8.33 | mg/L | 1826 | SM 4500-00 | 0.0 | |
| Total Kjeldahl Nitrogen (TKN) | 2.13 | mg/L | 1.39 | mg/L | 572 | 351.4 | 0.10 | |
| Nitrate Plus Nitrite Nitrogen | 1.28 | mg/L | 1.06 | mg/L | 3 | 353.2 | 0.10 | |
| Oil & Grease | 6.4 | mg/L | 5.5 | mg/L | 3 | 1664A | 5.0 | |
| Phosphorus (total) | 0.28 | mg/L | 0.23 | mg/L | 3 | 365.1 | 0.01 | |
| Total Dissolved Solids | 359 | mg/L | 440 | mg/L | 3 | SM 2540C | 1.0 | |
| Other | | | | N/A | | | | |

Lawrenceville Wastewater Treatment Plant (Permit # VA0020354)

Monthly Average Effluent Temperatures for 2007-2011

| Month | MONTHLY AVERAGE TEMPERATURE (°C) | | | | | 5-YEAR MONTHLY STATISTICS (°C) | | | |
|-------------------------------|----------------------------------|------|------|------|------|--------------------------------|------|------|---------------------------------------|
| | 2007 | 2008 | 2009 | 2010 | 2011 | Avg. | Min. | Max. | 90th Percentile (High Flow Months) |
| January | 13.9 | 13.0 | 12.4 | 11.2 | 11.4 | 12.4 | 11.2 | 13.9 | 17.3 |
| February | 11.9 | 13.8 | 11.9 | 9.7 | 12.5 | 11.9 | 9.7 | 13.8 | |
| March | 15.2 | 15.2 | 13.2 | 13.2 | 14.1 | 14.2 | 13.2 | 15.2 | |
| April | 17.3 | 17.3 | 16.4 | 17.3 | 17.4 | 17.1 | 16.4 | 17.4 | |
| May | 20.8 | 20.2 | 20.4 | 20.4 | 20.5 | 20.4 | 20.2 | 20.8 | |
| June | 23.6 | 24.7 | 23.5 | 24.9 | 24.8 | 24.3 | 23.5 | 24.9 | |
| July | 25.8 | 26.0 | 25.3 | 26.4 | 26.4 | 26.0 | 25.3 | 26.4 | |
| August | 27.4 | 26.4 | 26.7 | 26.9 | 26.4 | 26.8 | 26.4 | 27.4 | |
| September | 25.1 | 24.1 | 23.2 | 24.3 | 24.4 | 24.2 | 23.2 | 25.1 | |
| October | 22.1 | 20.2 | 20.0 | 20.4 | 20.4 | 20.6 | 20.0 | 22.1 | |
| November | 17.1 | 16.6 | 16.4 | 17.1 | 17.1 | 16.9 | 16.4 | 17.1 | |
| December | 15.1 | 14.3 | 13.6 | 13.4 | 15.7 | 14.4 | 13.4 | 15.7 | |
| | ▼ | ▼ | ▼ | ▼ | ▼ | | | | |
| Avg. | 20.1 | 19.9 | 19.1 | 19.4 | 20.0 | | | | |
| Min. | 11.9 | 13.8 | 11.9 | 9.7 | 12.5 | | | | |
| Max. | 27.4 | 26.4 | 26.7 | 26.9 | 26.4 | | | | |
| 90th Percentile (All Data) | 26.4 | | | | | | | | |

Lawrenceville Wastewater Treatment Plant (Permit # VA0020354)

Total Recoverable Zinc (mg/L): 2002-2011

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|-----------|-------|-------|-------|-------|-------|-------|---------|---------|---------|---------|
| January | | 0.027 | 0.037 | | 0.043 | 0.022 | | | | |
| February | | 0.044 | 0.029 | | 0.036 | | | | | |
| March | | 0.035 | 0.038 | | 0.038 | | | | | |
| April | | 0.028 | 0.044 | 0.041 | | | < 0.025 | < 0.025 | < 0.025 | < 0.025 |
| May | | 0.06 | 0.026 | | | | | | | |
| June | | 0.033 | 0.049 | 0.039 | | | | | | |
| July | 0.046 | 0.065 | 0.04 | 0.04 | 0.024 | | | | | |
| August | 0.059 | 0.031 | | 0.034 | 0.03 | | | | | |
| September | 0.04 | 0.039 | 0.02 | 0.07 | 0.038 | | | | | |
| October | 0.051 | 0.042 | | 0.068 | 0.036 | | < 0.025 | < 0.025 | < 0.025 | 0.025 |
| November | 0.072 | 0.041 | | 0.046 | | | | | | |
| December | 0.069 | 0.04 | 0.037 | 0.043 | 0.026 | | | | | |

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment G

Effluent Screening and Limitation Evaluations

MSTRANTI DATA SOURCE REPORT

Lawrenceville Wastewater Treatment Plant

2012 Permit Reissuance

| Stream Information | |
|------------------------------|--|
| Mean Hardness | Calculated from data collected from monitoring station 5ARSE001.22 (See Attachment D) |
| 90% Temperature (annual) | |
| 90% Temperature (wet season) | |
| 90% Maximum pH | |
| 10% Maximum pH | |
| Tier Designation | Flow Frequency Analysis: April 12, 2012 by J.V.Palmore, PG (See Attachment A) |
| Stream Flows | |
| All Data | Flow Frequency Analysis: April 12, 2012 by J.V.Palmore, PG (See Attachment A) |
| Mixing Information | |
| All Data | MIX.exe (See Attachment G) |
| Effluent Information | |
| Mean Hardness | Calculated or transcribed from data provided by the permittee through permit monitoring reports, application Form 2A, Attachment A, or submitted by request during the drafting phase for the 2012 permit (See Attachment F) |
| 90% Temperature (annual) | |
| 90% Temperature (wet season) | |
| 90% Maximum pH | |
| 10% Maximum pH | |
| Discharge Flow | |

Mixing Zone Predictions for Lawrenceville WWTP: VA0020354 (2012 Permit)

Effluent Flow = 1.2 MGD

Stream 7Q10 = .372 MGD

Stream 30Q10 = .626 MGD

Stream 1Q10 = .317 MGD

Stream slope = .002083 ft/ft

Stream width = 6 ft

Bottom scale = 1

Channel scale = 2

Ambient flows used for this mixing zone analysis are

- ◀ derived from the April 12, 2012 Flow Frequency Analysis by J.V. Palmore, PG (See Attachment A)

Stream characteristics used for this mixing zone

- ◀ analysis are derived from the water model analysis by Paul Herman (March 1996) included in Attachment D.

Mixing Zone Predictions @ 7Q10

Depth = .5154 ft

Length = 78.82 ft

Velocity = .7867 ft/sec

Residence Time = .0012 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .5673 ft

Length = 72.05 ft

Velocity = .8304 ft/sec

Residence Time = .001 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .5038 ft

Length = 80.5 ft

Velocity = .7766 ft/sec

Residence Time = .0288 hours

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 1Q10 may be used.

| Parameter (ug/l unless noted) | Background Conc. | Water Quality Criteria | | | | Wasteload Allocations | | | | Antidegradation Baseline | | | | Antidegradation Allocations | | | | Most Limiting Allocations | | | | Lowest LTA |
|--|---------------------|------------------------|---------|----------|---------|-----------------------|---------|----------|---------|--------------------------|---------|----------|----|-----------------------------|---------|----------|----|---------------------------|---------|----------|---------|------------|
| | | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | |
| 1,1,2,2-Tetrachloroethane ^c | 0 | -- | -- | na | 4.0E+01 | -- | -- | na | 1.7E+02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 1.7E+02 | -- |
| Tetrachloroethylene ^c | 0 | -- | -- | na | 3.3E+01 | -- | -- | na | 1.4E+02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 1.4E+02 | -- |
| Thallium | 0 | -- | -- | na | 4.7E-01 | -- | -- | na | 8.5E-01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 8.5E-01 | -- |
| Toluene | 0 | -- | -- | na | 6.0E+03 | -- | -- | na | 1.1E+04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 1.1E+04 | -- |
| Total dissolved solids | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | -- | -- |
| Toxaphene ^c | 0 | 7.3E-01 | 2.0E-04 | na | 2.8E-03 | 9.2E-01 | 2.6E-04 | na | 1.2E-02 | -- | -- | -- | -- | -- | -- | -- | -- | 9.2E-01 | 2.6E-04 | na | 1.2E-02 | 1.57E-04 |
| Tributyltin | 0 | 4.6E-01 | 7.2E-02 | na | -- | 5.8E-01 | 9.4E-02 | na | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.8E-01 | 9.4E-02 | na | -- | 5.67E-02 |
| 1,2,4-Trichlorobenzene | 0 | -- | -- | na | 7.0E+01 | -- | -- | na | 1.3E+02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 1.3E+02 | -- |
| 1,1,2-Trichloroethane ^c | 0 | -- | -- | na | 1.6E+02 | -- | -- | na | 6.8E+02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 6.8E+02 | -- |
| Trichloroethylene ^c | 0 | -- | -- | na | 3.0E+02 | -- | -- | na | 1.3E+03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 1.3E+03 | -- |
| 2,4,6-Trichlorophenol ^c | 0 | -- | -- | na | 2.4E+01 | -- | -- | na | 1.0E+02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 1.0E+02 | -- |
| 2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex) | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | -- | -- |
| Vinyl Chloride ^c | 0 | -- | -- | na | 2.4E+01 | -- | -- | na | 1.0E+02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | na | 1.0E+02 | -- |
| Zinc | 0 | 4.9E+01 | 4.9E+01 | na | 2.6E+04 | 6.1E+01 | 6.4E+01 | na | 4.7E+04 | -- | -- | -- | -- | -- | -- | -- | -- | 6.1E+01 | 6.4E+01 | na | 4.7E+04 | 2.53E+01 |

Notes:

- All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
- Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipal
- Metals measured as Dissolved, unless specified otherwise
- "C" indicates a carcinogenic parameter
- Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information. Antidegradation WLAs are based upon a complete mix.
- Antideg. Baseline = $(0.25(\text{WQC} - \text{background conc.}) + \text{background conc.})$ for acute and chronic
 $= (0.1(\text{WQC} - \text{background conc.}) + \text{background conc.})$ for human health
- WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

| Metal | Target Value (SSTV) |
|--------------|---------------------|
| Antimony | 1.2E+03 |
| Arsenic | 1.2E+02 |
| Barium | na |
| Cadmium | 3.9E-01 |
| Chromium III | 2.5E+01 |
| Chromium VI | 8.1E+00 |
| Copper | 2.6E+00 |
| Iron | na |
| Lead | 2.8E+00 |
| Manganese | na |
| Mercury | 6.1E-01 |
| Nickel | 6.6E+00 |
| Selenium | 3.9E+00 |
| Silver | 2.9E-01 |
| Zinc | 2.5E+01 |

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Temperature Screening: (Non-heated Discharge)

NOTE: The temperature screening below roughly evaluates the projected rise in temperature within the mixing zone during low flow conditions using 90%tile effluent temperature, and either 10%tile ambient temperature for heated discharges or 90%tile ambient temperature for non-heated discharges. This screening is for informational purposes only, and should not be used for limitation development.

1Q10 Acute - Maximum Allowable Rise Over Ambient = 2 °C

Mix 1Q10 Temperature (Non-heated Discharge)

$$\frac{(0.317 \text{ MGD} \times 22.9^\circ\text{C}) + (1.2 \text{ MGD} \times 26.4^\circ\text{C})}{(1.517 \text{ MGD})} = 25.67^\circ\text{C}$$

ΔT °C above
ambient ►

$$25.67^\circ\text{C} - 22.9^\circ\text{C} =$$

2.77 °C

7Q10 Chronic - Maximum Allowable Rise Over Ambient = 3 °C

Mix 7Q10 Temperature (Non-heated Discharge)

$$\frac{(0.372 \text{ MGD} \times 22.9^\circ\text{C}) + (1.2 \text{ MGD} \times 26.4^\circ\text{C})}{(1.572 \text{ MGD})} = 25.57^\circ\text{C}$$

ΔT °C above
ambient ►

$$25.57^\circ\text{C} - 22.9^\circ\text{C} =$$

2.67 °C

Ammonia (Annual)

6/8/2012 9:28:41 AM

Facility = Lawrenceville WWTP
Chemical = Ammonia (annual - mg/L)
Chronic averaging period = 30
WLAa = 26
WLAc = 3.44
Q.L. = 0.2
samples/mo. = 20
samples/wk. = 5

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 6.94078512135211
Average Weekly limit = 4.52371444842988
Average Monthly LImit = 3.57208733455938

The data are:

9

Ammonia (High Flow)

6/8/2012 9:34:01 AM

Facility = Lawrenceville WWTP
Chemical = Ammonia (Jan-Apr; mg/L)
Chronic averaging period = 30
WLAa = 70.2
WLAc = 24.8
Q.L. = 0.2
samples/mo. = 20
samples/wk. = 5

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

Copper (dissolved)

4/25/2012 12:19:21 PM

Facility = Lawrenceville WWTP
Chemical = Copper ($\mu\text{g/L}$)
Chronic averaging period = 4
WLAA = 6.4
WLAC = 4.8
Q.L. = 0.5
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 1.65
Variance = .9801
C.V. = 0.6
97th percentile daily values = 4.01513
97th percentile 4 day average = 2.74525
97th percentile 30 day average= 1.98998
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

1.88
1.4
1.67

Lead (total recoverable)

4/25/2012 12:36:45 PM

Facility = Lawrenceville WWTP
Chemical = Lead ($\mu\text{g/L}$)
Chronic averaging period = 4
WLAa = 40
WLAc = 4.7
Q.L. = .1
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = .56
Variance = .112896
C.V. = 0.6
97th percentile daily values = 1.36271
97th percentile 4 day average = .931722
97th percentile 30 day average= .675389
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

0.56

Nickel (dissolved)

4/25/2012 12:20:50 PM

Facility = Lawrenceville WWTP
Chemical = Nickel ($\mu\text{g/L}$)
Chronic averaging period = 4
WLAA = 96
WLAC = 11
Q.L. = 0.5
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = .744178
Variance = .199368
C.V. = 0.6
97th percentile daily values = 1.81089
97th percentile 4 day average = 1.23815
97th percentile 30 day average= .897518
< Q.L. = 1
Model used = BPJ Assumptions, Type 1 data

No Limit is required for this material

The data are:

0.74
0
0.5

Zinc (dissolved)

4/27/2012 9:45:15 AM

Facility = Lawrenceville WWTP
Chemical = Zinc ($\mu\text{g/L}$)
Chronic averaging period = 4
WLAa = 61
WLAc = 64
Q.L. = 2.0
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 28.3666
Variance = 289.680
C.V. = 0.6
97th percentile daily values = 69.0279
97th percentile 4 day average = 47.1961
97th percentile 30 day average= 34.2117
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 61
Average Weekly limit = 61
Average Monthly LImit = 61

The data are:

23.8
30.2
31.1

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment H

Whole Effluent Toxicity Data and Limitation Evaluation

WET-p.promelas

5/8/2012 12:06:13 PM

Facility = Lawrenceville WWTP
Chemical = WET - P.promelas Chronic Test
Chronic averaging period = 4
WLAA = 3.7925
WLAC = 1.31
Q.L. = 1
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 14
Expected Value = 1.51080
Variance = .741450
C.V. = 0.569943
97th percentile daily values = 3.55949
97th percentile 4 day average = 2.45765
97th percentile 30 day average= 1.80651
< Q.L. = 0
Model used = lognormal

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 1.89731290451866
Average Weekly limit = 1.89731290451866
Average Monthly LImit = 1.89731290451866

The data are:

1
4.71
1.18
1
1
2.35
3.45
1
1
1
1
1
1
1
1

Kazio, Jeremy (DEQ)

From: DeBiasi, Deborah (DEQ)
Sent: Thursday, May 10, 2012 5:29 PM
To: Kazio, Jeremy (DEQ)
Subject: RE:

I spoke with Robbie Williams and had him explain what they did with sample bottles, and while what they are doing is working (ala HRSD), I suggested a couple of things they could do themselves that would save them money:

- They maintain their sample device jugs – clean with soap and water, and have a spare or two so the washed one would dry inbetween uses. They could buy the Tygon tubing and reload the samplers themselves too. Glass jugs would be best and easiest to clean, but subject to breakage, so they'd need some spares. He wasn't sure they could do that so they will probably stick with HRSD.
- I even suggested that they use a wage person to drive the samples to CBI – 2.5 hours from Lawrenceville – but Robbie thought they might get lost.

He's very nice and conscientious but will probably stick with what he's doing since he doesn't think the "town" managers will buy off on changes. I told him I'd be glad to talk to them if it would help.

As for permitting, just put the limit in with the *P. promelas* and we'll disregard the *C. dubia* test as not representative of their effluent. I'll be here tomorrow if you have questions.

Deborah L. DeBiasi, Virginia DEQ
Office of Water Permit and Compliance Assistance Programs
Email: Deborah.DeBiasi@deq.virginia.gov
PH: 804-698-4028

From: Kazio, Jeremy (DEQ)
Sent: Thursday, May 10, 2012 12:27 PM
To: DeBiasi, Deborah (DEQ)
Subject:

Jeremy S. Kazio
Water Permit Writer
DEQ Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
Tel: (804) 527-5044



Kazio, Jeremy (DEQ)

From: DeBiasi, Deborah (DEQ)
Sent: Thursday, May 31, 2012 3:24 PM
To: Kazio, Jeremy (DEQ)
Subject: RE: VA0020354 Lawrenceville WWTP - WET Limitation and Monitoring Requirements

Thanks for the reminder – email does get buried here. I made some edits on your permit language, so let me know if you have any questions or comments about it.

Deb

Deborah L. DeBiasi, Virginia DEQ
Office of Water Permit and Compliance Assistance Programs
Email: Deborah.DeBiasi@deq.virginia.gov
PH: 804-698-4028

From: Kazio, Jeremy (DEQ)
Sent: Thursday, May 31, 2012 11:47 AM
To: DeBiasi, Deborah (DEQ)
Subject: FW: VA0020354 Lawrenceville WWTP - WET Limitation and Monitoring Requirements

Deborah,

Have you gotten a chance to take a look at this yet? I'm not trying to be pushy, just wanted to make sure you hadn't forgotten. Thanks so much!!

From: Kazio, Jeremy (DEQ)
Sent: Friday, May 11, 2012 9:17 AM
To: DeBiasi, Deborah (DEQ)
Subject: VA0020354 Lawrenceville WWTP - WET Limitation and Monitoring Requirements

Deborah,

This email is to obtain your recommendations and/or concurrence on the WET evaluation, limitation, and proposed language for the draft 2012 permit for the subject facility.

The Town of Lawrenceville Wastewater Treatment Plant (Lawrenceville WWTP) is a publicly owned municipal treatment works with a design flow of 1.2 MGD. The treatment works serves the Town of Lawrenceville, the nearby Brunswick Jail, and will serve the proposed Meherrin Regional Jail, and does not have any significant industrial users (an industrial user survey requirement is included with the draft permit). The treatment process consists of influent screening, grit removal, primary settling, oxidation ditches, clarification, ultraviolet disinfection, and step aeration. The 2012 permit proposed limitations and monitoring requirements are as follows:

| EFFLUENT CHARACTERISTICS | | DISCHARGE LIMITATIONS | | | | | |
|---|-----------|--|----------------|------------------|-----------------|-----------------|-----------------------------|
| | | MONTHLY AVERAGE | | WEEKLY AVERAGE | | MINIMUM | MAXIMUM |
| Flow (MGD) ^(a) | | NA | | NA | | NA | NA |
| pH | | NA | | NA | | 6.0 SU | 9.0 SU |
| cBOD₅ ^(a) | Jan - Apr | 20 mg/L | 91 kg/d | 30 mg/L | 140 kg/d | NA | NA |
| | May - Dec | 10 mg/L | 45 kg/d | 15 mg/L | 68 kg/d | NA | NA |
| Total Suspended Solids (TSS) ^(a) | | 20 mg/L | 91 kg/d | 30 mg/L | 140 kg/d | NA | NA |
| Ammonia as N | Jan - Apr | 13.5 mg/L | | 13.5 mg/L | | NA | NA |
| Total Kjeldahl Nitrogen (TKN) | May - Dec | 3.0 mg/L | 14 kg/d | 4.5 mg/L | 20 kg/d | NA | NA |
| Dissolved Oxygen (DO) | Jan - Apr | NA | | NA | | 5.0 mg/L | NA |
| | May - Dec | NA | | NA | | 6.5 mg/L | NA |
| E.coli | | 128 N / 100 mL (Geometric Mean) | | NA | | NA | NA |
| Zinc, Total Recoverable | | 61 µg/L | | 61 µg/L | | NA | NA |
| Chronic 7-Day Static Renewal Survival and Growth Test: [<i>Pimephales promelas</i>] ^(a) | | NA | | NA | | NA | TU_c = 1.9 |

Attached to this email is a summary of the WET testing results submitted to DEQ between 1999-2012. Also included in the same Excel workbook are the WETLIM results for each species that were evaluated (chronic tests were chosen). As we discussed earlier, the limitation for P.promelas will remain the same as the 2007 limitation, and was chosen because historical data indicates that it is the most sensitive species.

Below is the proposed 2012 draft permit language for WET testing. Please feel free to edit the language in any way you see fit. Thank you!!

B. Whole Effluent Toxicity (WET) Testing

1. The Whole Effluent Toxicity limitation of ≤ 1.9 TU_c (NOEC $\geq 53\%$) in Part I.A. is a final limit that is effective with the date of permit issuance. ~~with an effective date beginning with the effective date of the permit.~~
2. Commencing no later than one (1) month (Consider making this within 3 months to allow time for the lab to have the organisms and be ready to test) following the effective date of the permit, the permittee shall conduct quarterly chronic toxicity tests using 24-hour flow-proportioned composite samples of final effluent from Outfall 001 in accordance with the limitation and monitoring frequency in Part I.A.1 and Part I.A.5 of this permit. The chronic tests to use is are:

Chronic 7-Day Survival and Growth Static Renewal Test using *Pimephales promelas*

These chronic tests shall be conducted in such a manner and at sufficient dilutions (minimum of five dilutions, derived geometrically) to determine the "No Observed Effect Concentration" (NOEC) for survival and ~~reproduction~~ or growth. Results which cannot be quantified (i.e. a "less than" NOEC value) are not acceptable, and a retest will have to be performed. A retest of a non-acceptable test must be performed during the same compliance period as the test it is replacing. Express the test NOEC as TU_c (Chronic Toxicity Units), by dividing 100/NOEC for DMR reporting. Report the LC50 at 48 hours and the IC25 with the NOEC's in the test report.

3. The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters. The pollutant specific limits must control the toxicity of the effluent.
4. Reporting Schedule

The permittee shall submit the toxicity test results **with the DMR** to the DEQ Piedmont Regional Office for the tests specified no later than the 10th of the month immediately following each calendar quarter in which a toxicity test was performed.

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment I

No Exposure Certification Information

**VIRGINIA DEQ NO EXPOSURE CERTIFICATION
FOR EXCLUSION FROM VPDES STORM WATER PERMITTING**

Submission of this No Exposure Certification constitutes notice that the entity identified below does not require permit authorization for its storm water discharges associated with industrial activity under the VPDES Permit Program due to the existence of a condition of No Exposure.

A condition of No Exposure exists at an industrial facility when all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products. Material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product or waste product. A storm resistant shelter is not required for the following industrial materials and activities:

- drums, barrels, tanks, and similar containers that are tightly sealed, provided those containers are not deteriorated and do not leak. "Sealed" means banded or otherwise secured and without operational taps or valves;
- adequately maintained vehicles used in material handling; and
- final products, other than products that would be mobilized in storm water discharges (e.g., rock salt).

A No Exposure Certification must be provided for each facility qualifying for the No Exposure exclusion. In addition, the exclusion from VPDES permitting is available on a facility-wide basis only, not for individual outfalls. If any industrial activities or materials are or will be exposed to precipitation, the facility is not eligible for the No Exposure exclusion.

By signing and submitting this No Exposure Certification form, the entity below is certifying that a condition of No Exposure exists at its facility or site, and is obligated to comply with the terms and conditions at 9 VAC 25-31-120 E (the VPDES Permit Regulation).

Please Type or Print All Information. ALL INFORMATION ON THIS FORM MUST BE PROVIDED.

1. Facility Operator Information

Name: Town of Lawrenceville

Mailing Address: 400 North Main Street

City: Lawrenceville State: Va Zip: 23868 Phone: 434-848-2414

2. Facility/Site Location Information

Facility Name: Town of Lawrenceville WWTP

Address: 380 Meadow Lane

City: Lawrenceville State: VA Zip: 23868

County Name: Brunswick

Latitude: 36°44'49.80" N Longitude: 77°50'16.77" W

3. Was the facility or site previously covered under a VPDES storm water permit? Yes No

If "Yes", enter the VPDES permit number: _____

4. SIC/Activity Codes: Primary: 4952 Secondary (if applicable): _____

5. Total size of facility/site associated with industrial activity: 28.2 acres

6. Have you paved or roofed over a formerly exposed pervious area in order to qualify for the No Exposure exclusion? Yes No

If "Yes", please indicate approximately how much area was paved or roofed. Completing this question does not disqualify you for the No Exposure exclusion. However, DEQ may use this information in considering whether storm water discharges from your site are likely to have an adverse impact on water quality, in which case you could be required to obtain permit coverage.

Less than one acre

One to five acres

More than five acres

7. Exposure Checklist

Are any of the following materials or activities exposed to precipitation, now or in the foreseeable future? (Please check either "Yes" or "No" in the appropriate box.) If you answer "Yes" to any of these questions (1) through (11), you are not eligible for the No Exposure exclusion.

| | Yes | No |
|---|--------------------------|-------------------------------------|
| (1) Using, storing or cleaning industrial machinery or equipment, and areas where residuals from using, storing or cleaning industrial machinery or equipment remain and are exposed to storm water | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (2) Materials or residuals on the ground or in storm water inlets from spill/leaks | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (3) Materials or products from past industrial activity | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (4) Material handling equipment (except adequately maintained vehicles) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (5) Materials or products during loading/unloading or transporting activities | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (6) Materials or products stored outdoors (except final products intended for outside use [e.g., new cars] where exposure to storm water does not result in the discharge of pollutants) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (7) Materials contained in open, deteriorated or leaking storage drums, barrels, tanks, and similar containers | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (8) Materials or products handled/stored on roads or railways owned or maintained by the discharger | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (9) Waste material (except waste in covered, non-leaking containers [e.g., dumpsters]) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (10) Application or disposal of process wastewater (unless otherwise permitted) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (11) Particulate matter or visible deposits of residuals from roof stacks and/or vents not otherwise regulated (i.e., under an air quality control permit) and evident in the storm water outflow | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

8. Certification Statement

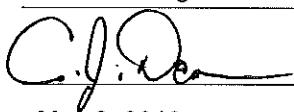
I certify under penalty of law that I have read and understand the eligibility requirements for claiming a condition of no exposure and obtaining an exclusion from VPDES storm water permitting; and that there are no discharges of storm water contaminated by exposure to industrial activities or materials from the industrial facility identified in this document (except as allowed under 9 VAC 25-31-120 E 2).

I understand that I am obligated to submit a No Exposure Certification form once every five years to the Department of Environmental Quality and, if requested, to the operator of the local MS4 into which this facility discharges (where applicable). I understand that I must allow the Department, or MS4 operator where the discharge is into the local MS4, to perform inspections to confirm the condition of no exposure and to make such inspection reports publicly available upon request. I understand that I must obtain coverage under a VPDES permit prior to any point source discharge of storm water associated with industrial activity from the facility.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly involved in gathering the information, the information submitted is to the best of my knowledge and belief true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name: C. J. Dean

Print Title: Town Manager

Signature: 

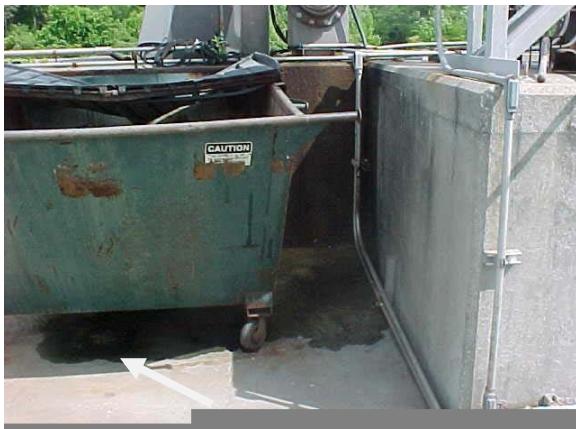
Date: May 3, 2012

For Department of Environmental Quality Use Only

Accepted/Not Accepted by: Jeremy Kazio, Water Permit Writer Date: May 14, 2012

Jeremy,

On May 9, 2011 I inspected the Lawrenceville WWTP - located at 380 Meadow Lane, Lawrenceville, VA 23868 - for No Exposure Certification. This is a 1.2 mgd wastewater treatment plant for the Town of Lawrenceville. I walked the site with Robert Williams, Jr., Chief Operator. Grit and screenings are discharged to a small dumpster located at the headworks; any spillage is to a concrete pad with an area drain that is tied into the treatment plant. Used oil from the various pieces of equipment is picked up periodically for recycle. Drums of polymer are stored under roof in the bio-solids truck loading area. The septage receiving station is maintained in an orderly manner; any spillage is to a concrete pad with an area drain that is tied into the treatment plant. The emergency diesel generator has a self contained fuel tank. **No Exposure Certification is recommended.**



Dumpster at headworks. Any spillage is to a concrete pad with an area drain (arrow) tied into the treatment plant.



Drums of polymer are stored under roof



Septage receiving station. Any spillage is to a concrete pad with an area drain (arrow) tied into the treatment plant.



The emergency diesel generator has a self contained fuel tank.

Mike Dare
Environmental Inspector
Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
Phone: 804-527-5055

Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment J

VDH-ODW Concurrence and T&E Coordination

RECEIVED

APR 30 2012

PRO

MEMORANDUM

DATE: April 27, 2012

TO: Jeremy S. Kazio, Water Permit Writer
DEQ Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

FROM: Mitchell R. Childrey, P.E., Engineering Field Director
VDH-ODW-Danville Field Office

Mitchell R. Childrey

CITY/COUNTY: Brunswick County (Town of Lawrenceville)

SUBJECT: VPDES Application No. 0020354 Existing Proposed
 VWP Permit No. _____ Existing Proposed
 Other: _____

OWNER/APPLICANT: Town of Lawrenceville

LOCATION OF DISCHARGE/ACTIVITY: N 36°44'37" ; W 77°50'10"

- There are no public water supply raw water intakes within 15 miles downstream of the discharge.
- The raw water intake for _____ waterworks is located _____ miles downstream from the discharge. We recommend a minimum Reliability Class _____ for this facility [which is] [the same as the existing Reliability Class] [more stringent than the existing Reliability Class].
- The raw water intake for _____ waterworks is located _____ miles downstream from the discharge.
- Please forward a copy of the Draft Permit for our review and comment.
- Other Comments: _____

Reviewer:

Brynn M. Hinman 4-27-12



VPDES PERMITS

Threatened and Endangered Species Coordination

To:

- DGIF, Environmental Review Coordinator
- DCR
- USFWS, T/E Review Coordinator

From: Jeremy Kazio, Permit Writer

Date Sent: 4/20/2012

Permit Number: VA0020354

Facility Name: Lawrenceville Wastewater Treatment Plant (WWTP)

Contact: C.J. Dean, Town Manager (Lawrenceville)

Phone: (434) 848-2414

Address: 400 N.Main St., Lawrenceville VA 23868

Location: 36.7474580°N / -77.8364597°W

USGS Quadrangle: Powelton (9A)

Latitude/Longitude: See above

Receiving Stream: Roses Creek

Receiving Stream Flow Statistics used for Permit:

| | | |
|----------------------|-------|-----|
| 1Q10 (Annual) = | 0.317 | MGD |
| 7Q10 (Annual) = | 0.372 | MGD |
| 30Q10 (Annual) = | 0.626 | MGD |
| 1Q10 (Wet season) = | 2.62 | MGD |
| 30Q10 (Wet season) = | 5.17 | MGD |
| 30Q5 = | 0.973 | MGD |
| Harmonic Mean = | 3.88 | MGD |

Effluent Characteristics and Max Daily Flow:

Design Flow = 1.2 MGD

Average Flow 2011-2012 = 0.80 MGD

Species Search Results (or attach database report and map):



DGIF Online Report.pdf



Threatened Species.pdf

Attach draft permit effluent limits page if available.

DGIF email: projectreview@dgif.virginia.gov

USF&W fax: (804)693-9032



Virginia Department of Game and Inland Fisheries

4/20/2012 1:45:12 PM

Fish and Wildlife Information Service

VaFWIS Search Report Compiled on 4/20/2012, 1:45:12 PM

[Help](#)

Known or likely to occur within a **2 mile radius around point 36.7474580 -77.8364597**
in 025 Brunswick County, VA
where (060173) [Pigtoe, Atlantic](#) observed.

[View Map of Site Location](#)

Bat Colonies or Hibernacula: **Not Known**

Threatened and Endangered Waters where Pigtoe, Atlantic (060173) observed

(1 Reach)

[View Map of All Threatened and Endangered Waters](#)

| Stream Name | T&E Waters Species | | | | | View Map |
|---|--------------------|--|------|----|----------------------------------|--------------------------|
| | Highest TE* | BOVA Code, Status*, Tier**, Common & Scientific Name | | | | |
| Meherrin River (03010204) | FSST | 060081 | ST | II | Floater, green | Lasmigona subviridis |
| | | 060173 | FSST | II | Pigtoe, Atlantic | Fusconaiamasoni |

* FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened;
FC=Federal Candidate; FS=Federal Species of Concern; CC=Collection Concern

** I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need

Habitat Predicted for Aquatic WAP Tier I & II Species where Pigtoe, Atlantic (060173) observed

(3 Reaches)

[View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species](#)

| Stream Name | Tier Species | | | | | View Map |
|--|--------------|--|------|----|----------------------------------|--------------------------|
| | Highest TE* | BOVA Code, Status*, Tier**, Common & Scientific Name | | | | |
| Great Creek (03010204) | FSST | 060081 | ST | II | Floater, green | Lasmigona subviridis |
| | | 060173 | FSST | II | Pigtoe, Atlantic | Fusconaiamasoni |

| | | | | | | | |
|------------------------------|------|--------|------|----|----------------------------------|-----------------------|---------------------|
| Great Creek (03010204) | FSST | 060173 | FSST | II | Pigtoe, Atlantic | Fusconaia masoni | Yes |
| Meherrin River (03010204) | FSST | 010174 | | II | Bass, Roanoke | Ambloplites cavifrons | Yes |
| | | 060081 | ST | II | Floater, green | Lasmigona subviridis | |
| | | 060173 | FSST | II | Pigtoe, Atlantic | Fusconaia masoni | |

Habitat Predicted for Terrestrial WAP Tier I & II Species where Pigtoe, Atlantic (060173) observed

N/A

USGS National 6th Order Watersheds Summary of Wildlife Action Plan Tier I, II, III, and IV Species:

| HU6 Code | USGS 6th Order Hydrologic Unit | Different Species | Highest TE | Highest Tier |
|----------|--|-------------------|------------|--------------|
| CM14 | Meherrin River-Allen Creek | 51 | FSST | I |
| CM16 | Great Creek | 51 | FSST | I |

Compiled on 4/20/2012, 1:45:12 PM l390657.2 report=BOVA searchType=R dist= 3218 poi= 36.7474580 -77.8364597

audit no. 390657 4/20/2012 1:45:12 PM Virginia Fish and Wildlife Information Service
 © 1998-2012 Commonwealth of Virginia Department of Game and Inland Fisheries

Kazio, Jeremy (DEQ)

From: ProjectReview (DGIF)
Sent: Tuesday, June 05, 2012 3:18 PM
To: Kazio, Jeremy (DEQ); nhreview (DCR)
Cc: ProjectReview (DGIF); Cason, Gladys (DGIF)
Subject: ESSLog 32867; DEQ VPDES re-issuance VA 0020354; Lawrenceville WWTP in Lawrenceville , Virginia

We have reviewed the above-referenced VPDES permit re-issuance. According to the application, the receiving stream is Roses Creek (with a 7Q10 of 0.372 million gallons per day) a headwater tributary to the Meherrin River. The Design flow for this facility is 1.2 Million Gallons per Day (MGD). The facility uses ultraviolet (UV) disinfection.

According to our records, the state Threatened (ST) green floater and ST Atlantic pigtoe are known from the Meherrin River, a designated Threatened and Endangered (T&E) species waters for these species.

We recommend and support ultraviolet (UV) disinfection rather than chlorination. The ammonia limits proposed within the EPA rule are expressed on the basis of total ammonia-nitrogen (TAN). The proposed EPA ammonia limit for waters with mussels (not T&E mussels, any mussel species) is:

- CMC (Criterion Maximum Concentration or acute) - 2.9 mg N/L (at pH 8 and 25C)
- CCC (Criterion Continuous Concentration or chronic) - 0.26 mg N//L (at pH 8 and 25C) with a 4-day average within the 30 day average period no higher than 2.5 the CCC, which would be 0.65 mg N/L.

The ammonia limits proposed within the EPA rule are the best information currently available regarding ammonia levels protective of mussels. Therefore, we recommend the EPA values be implemented in this permit for this and all future VPDES permits.

This project is located within 2 miles of a documented occurrence of a state or federal threatened or endangered plant or insect species and/or other Natural Heritage coordination species. Therefore, we recommend coordination with VDCR-DNH regarding the protection of these resources. We also recommend contacting the USFWS regarding all federally listed species.

Provided the applicant adheres to the effluent characteristics identified in the permit application, we do not anticipate the re-issuance of this permit to result in adverse impact to designated T&E species waters or their associated species. Thank you for the opportunity to provide comments.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
P.O. Box 11104
4010 West Broad Street
Richmond, VA 23230
Phone: (804) 367-2733
FAX: (804) 367-2427
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Fact Sheet
Lawrenceville WWTP
VA0020354

Attachment K

2012 Application Waiver Requests and DEQ Approvals



January 24, 2012

Mr. Curt Linderman
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

RECEIVED
JAN 25 2012
PRO

Ref: permit renewal for Lawrenceville # VA0020354

Dear Mr. Linderman:

The Town of Lawrenceville is in the process of completing the required testing for the permit renewal, Section 2A. The appendix A- Guidance for Completing the Effluent Testing Information; All Treatment Works specifies that samples must be representative and taken no fewer than four months apart and more than eight months apart.

The Town of Lawrenceville will conduct three rounds of testing, however, we are requesting a variance to the rules and request a waiver of the eight month maximum span between the samples. Lawrenceville had Hampton Roads Sanitation District conduct the first round of testing for the permit renewal on September 1, 2010. The second and third sample rounds were not taken due to a snafu in the sampling arrangement, but are now scheduled. Both additional rounds of testing will be conducted prior to the permit renewal deadline. This will give the data that shows seasonal variance in the Lawrenceville Plant performance. Since September 2010, the Lawrenceville treatment plant, a 1.2 MGD treatment plant has experienced average flows of less than 0.760 MGD, and has had no operational changes and no changes within the customer base that would affect the influent stream.

Please let me know when or if this waiver could be granted so that we can proceed with the scheduled sampling in order for the permit to be submitted on time, March 10, 2012.

Thank you in advance for your help in this matter,

C J Dean

cc:Jeremy Kazio, DEQ
Robert Williams, Lawrenceville
Danny Barker, HRSD



MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY *Piedmont Regional Office*

4949-A Cox Road

Glen Allen, VA 23060

804/527-5020

SUBJECT: Waiver Request for VA0020354 – Town of Lawrenceville Wastewater Treatment Plant

TO: Curtis J. Linderman – Water Permit Manager

FROM: Jeremy Kazio – Water Permit Writer

DATE: January 30, 2012

COPIES: EPA/Region III; File

PERMIT EXPIRATION DATE: September 10, 2012

PERMIT APPLICATION DUE DATE: March 14, 2012

The Town of Lawrenceville Wastewater Treatment Plant (Lawrenceville WWTP) is a publicly owned municipal treatment works with a design flow of 1.2 MGD. The treatment works serves the Town of Lawrenceville, the nearby Brunswick Jail, and will serve the proposed Meherrin Regional Jail, and does not have any industrial users. The treatment process consists of influent screening, grit removal, primary settling, oxidation ditches, clarification, ultraviolet disinfection, and step aeration. The 2007 permit limitations are as follows:

| EFFLUENT CHARACTERISTICS | | DISCHARGE LIMITATIONS | | | | | MONITORING | | |
|---|------------|-----------------------|---------|----------------------|----------|----------|----------------------|----------------------------|--------------------------------------|
| | | MONTHLY AVERAGE | | WEEKLY AVERAGE | | MINIMUM | MAXIMUM | FREQ. | SAMPLE TYPE |
| Flow (MGD) | | NL | | NA | | NA | NL | Continuous | Totalizing, Indicating and Recording |
| pH (standard units) | | NA | | NA | | 6.0 | 9.0 | 1/Day | Grab |
| cBOD ₅ | Jan.-Apr. | 20 mg/L | 90 kg/d | 30 mg/L | 140 kg/d | NA | NA | 1/Week | 24 HC |
| | May-Dec. | 10 mg/L | 45 kg/d | 15 mg/L | 68 kg/d | | | | |
| Total Suspended Solids (TSS) | | 20 mg/L | 90 kg/d | 30 mg/L | 140 kg/d | NA | NA | 1/Month | 24 HC |
| Ammonia | Jan.- Apr. | 13.5 mg/L | | NA | | NA | 13.5 mg/L | 1/Month | Grab |
| Total Kjeldahl Nitrogen (TKN) | May-Dec. | 3.0 mg/L | 14 kg/d | 4.5 mg/L | 20 kg/d | NA | NA | 3D/Week | 24 HC |
| Dissolved Oxygen | Jan.-Apr | NA | | NA | | 5.0 mg/L | NA | 1/Day | Grab |
| | May-Dec. | | | | | 6.5 mg/L | | | |
| Fecal Coliform (Colonies /100 mL) | | 200 N Geometric Mean | | 200 N Geometric Mean | | NA | NA | 5D/Week 10 a.m.- 4 p.m. | Grab |
| Total Recoverable Zinc | | 0.075 mg/L | | 0.075 mg/L | | NA | NA | 1/ Six Months | Grab |
| TU _c – Chronic 7-Day Static Renewal Survival | | NA | | NA | | NA | TU _c =1.9 | 1/ Three Months | 24HC |

The attached waiver request letter from C.J. Dean, Town Manager of the Town of Lawrenceville, was received by the Department of Environmental Quality-Piedmont Regional Office (DEQ-PRO) on January 25, 2012. The permittee has requested to be granted a waiver from the eight (8) month maximum time span between any two of three required sampling events applied to Section D of EPA Application Form 2A. According to Appendix A of the Form 2A Instructions (pg. 13), ". . . At least two of the samples used to complete the effluent testing information questions must have been taken no fewer than 4 months and no more than 8 months apart."

The Town of Lawrenceville hired the Hampton Roads Sanitation District (HRSD) to conduct all of the sampling necessary to complete Form 2A. The HRSD conducted the first sampling event on September 1, 2010, but did not conduct the subsequent second and third sampling events within the allotted time span noted above. Upon completing the remaining portions of the application in January 2012 to meet the March 12, 2012 deadline, the permittee realized that the full three rounds of testing had not been completed. The permittee conducted the second sampling event on January 26, 2012, and proposes to conduct the third sampling event prior to the application submittal due date for the 2012 permit reissuance.

Recommendations:

In the abovementioned section of the Form 2A Instructions, the justification provided for requiring at least two sampling events to take place within a 4 to 8 month period is that the application data ". . . must be representative of the treatment works' discharge and take into consideration seasonal variations." The typical effluent characterization and flow scheme at the Lawrenceville WWTP have not changed since the September 1, 2010 sampling event. Effluent data from Discharge Monitoring Reports submitted between January 2010 and January 2012 support the argument that there has been little variation in flow and treatment capabilities during the past two years. Consequently, the combined summer (September 2010) and winter (January 2012) sampling events would fulfill the aforementioned seasonal variation requirements, and therefore satisfy the intent of gathering representative effluent data for the purposes of permit development.

In addition to the intent of the Form 2A instructions being met, the permittee's waiver request supports the submittal of a complete application by the due date for the 2012 permit reissuance. Late application submittal may cause delays in the permit reissuance, the consequences of which are complicated by this being a major municipal facility and the permit being currently on the EPA's Priority List.

Staff recommends approval of the permittee's waiver request as described above.

Approved Denied

Comments: DEQ approval is conditioned on subsequent concurrence/approval from EPA Region III.



Signature – Water Permit Manager

January 30, 2012
Date



April 10, 2012

Mr. Jeremy Kazio
Department of Environmental Quality
4949-A Cox Road
Richmond, VA 23058

RE: Permit application waiver for Lawrenceville WWTP (VA0020354)

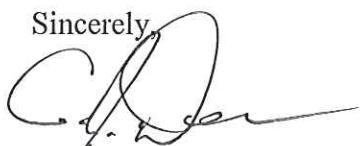
Dear Mr. Kazio:

The Town of Lawrenceville has submitted a VPDES permit VA0020354 renewal application recently and we are asking for a waiver for the application to the permit application requirements.

Per 9 VAC25-31-100J., the Town of Lawrenceville is requesting a waiver to submit and use dissolved metals data in lieu of total recoverable metals data to complete Form 2A. Part D (Expanded Effluent Testing). The Virginia Water Quality Standards Regulations, 9VAC 25-260-5 et. seq., list requirements which apply to dissolved metals. Therefore, it is more representative to provide dissolved metals data to DEQ for your evaluation of reasonable potential by the plant effluent to exceed the water quality standards of the receiving waters. The Town of Lawrenceville believes that total recoverable metals data is not of material concern for these VPDES permits.

Please contact me at 434-848-2414 if you have any questions. Thank you for your consideration of this waiver request.

Sincerely,


C.J. Dean

C.J. Dean, Town Manager

cc: Robbie Williams
Danny Barker



MEMORANDUM Error! Bookmark not defined.

**DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office**

4949-A Cox Road

Glen Allen, VA 23060

804/527-5020

SUBJECT: Waiver Request for VA0020354 – Lawrenceville STP

TO: Curtis Linderman – Water Permit Manager

FROM: Jeremy Kazio – Water Permit Writer

DATE: April 19, 2012

COPIES: File

The attached waiver request, dated April 10, 2012, is from CJ Dean, Lawrenceville Town Manager. The permittee has requested a waiver of the total recoverable testing requirements contained in Part D. of Application Form 2A in lieu of testing for the dissolved form of each metal. The basis of the permittee's request is that metals criteria in the Virginia Water Quality Standards (9VAC 25-260) are in the dissolved form; therefore it would be more representative to provide dissolved metals data for use in performing reasonable potential analysis of the effluent to exceed water quality criteria in the receiving waters.

The facility is a municipal major discharging to a freshwater stream (Roses Creek) in the Meherrin River Basin. Therefore, the permittee must fulfill Attachment A testing requirements as well as all parameters contained in Part D. of Application Form 2A.

Recommendations:

I recommend approving the waiver request with the following exception:

- Total Recoverable Selenium

In requesting the abovementioned waiver, the permittee is trying to eliminate redundant testing while fulfilling the requirements of Attachment A and Form 2A. Most of the metals parameters applicable to the permittee's testing requirements are shared between these two forms. The metals criteria contained in the Water Quality Standards (9 VAC 25-260) for freshwater are based on the dissolved form of those metals due to bioavailability. The exception to this is Selenium.

Approved as Recommended

Denied

Comments:

Approved as recommended for the 2012 permit cycle, only.

A handwritten signature in blue ink, appearing to read "Curtis Linderman".

Signature

May 15, 2012
Date